ENVIRON

ADDENDUM TO REMEDIAL INVESTIGATION REPORT

Remedial Investigation/Feasibility Study
Eagle Zinc Company Site
Hillsboro, Illinois

Submitted to:

U.S. Environmental Protection Agency, Region 5
and
Illinois Environmental Protection Agency

Submitted by:

ENVIRON International Corporation
Deerfield, Illinois

On behalf of:

Eagle Zinc Parties

February 2006

February 17, 2006

Mr. Dion Novak
Superfund Division
United States Environmental Protection Agency
77 West Jackson Boulevard (Mail Code: SR-6J)
Chicago, IL 60604

Re: Revised Addendum to Remedial Investigation Report
Remedial Investigation/Feasibility Study
Eagle Zinc Company Site, Hillsboro, Illinois

Dear Mr. Novak:

Enclosed please find the revised report entitled *Addendum to Remedial Investigation Report* for the Eagle Zinc Company Site. Responses to the comments on the draft report provided in USEPA's letter, dated December 22, 2005, are included in Appendix B of the report.

If you have any questions concerning this submission, please do not hesitate to contact us.

Sincerely,

ENVIRON International Corporation

F. Ross Jones

F. Ross Jones, P.G.
Manager

FRJ:rms

Enclosure

cc: Thomas Krueger, Esq. – USEPA Region 5
Mr. Rick Lanham – IEPA Bureau of Land
Ms. Lisa Cundiff – CH2M HILL
John Ix, Esq. – Dechert
Lois Kimbol, Esq. – Dechert
Mr. Paul Harper – Eagle-Picher
Mr. Gordon Kuntz – Sherwin-Williams
Mr. Tim Barber – ENVIRON International Corporation
Mr. Jeff Margolin – ENVIRON International Corporation

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Under penalty of law, I certify that, to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of this Report, the information submitted is true, accurate, and complete.

Timothy R. Barber, Ph.D.
Project Coordinator
Eagle Zinc Company Site

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LIST OF ACRONYMS

AOC	Administrative Order on Consent
bgs	below ground surface
COPCs	Constituents of Potential Concern
CPH	Carbon Plant Hutch
Enchem	Enchem Laboratory
ENVIRON	ENVIRON International Corporation
ERSE	Ecological Risk Screening Evaluation
ESVs	Ecotoxicity Screening Values
GBI	Goodwin-Broms, Inc.
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
IDPH	Illinois Department of Public Health
mg/kg	milligrams per kilogram
µm	micrometer or micron
MP	Miscellaneous Piles
m/s	meters per second
MSA	Metropolitan Statistical Area
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NOAELs	No Observed Adverse Effects Levels
NP	New Piles
PEF	Particulate Emission Factor
PEF_{RP}	Residue Pile-Specific PEFs
PM	Particulate Matter
RBCs	Risk-Based Concentrations
RCO	Rotary Clean Out
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RRO	Rotary Residue Oversize
RR1	Rotary Residue Type 1
RR2	Rotary Residue Type 2
RSLs	Residue pile screening levels
SMDPs	Scientific Management Decision Points
SOW	Statement of Work
SPLP	Synthetic Precipitation Leaching Procedure
SROs	Soil Remediation Objectives
TACO	Tiered Approach to Corrective Action Objectives
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leaching Procedure
Us	Surface Wind Speed
Ur	Approach Wind Speed
USEPA	United States Environmental Protection Agency

I. INTRODUCTION

A. Purpose of Report

This report is an addendum to the *Remedial Investigation Report, Eagle Zinc Company Site, Hillsboro, Illinois* (the "RI Report"), which was submitted to the United States Environmental Protection Agency (USEPA) as a final document in February 2005. This additional phase of work, herein referred to as the "RI Addendum," focuses on the evaluation of potential risks associated with historical residual material stockpiles ("residue piles") at the Eagle Zinc Company Site (the "Site"). ENVIRON International Corporation (ENVIRON) has prepared this report on behalf of the Eagle Zinc Parties (the "Parties") as part of the Remedial Investigation/Feasibility Study (RI/FS) for the Site. The RI/FS is being completed pursuant to the Statement of Work (SOW) contained in the December 31, 2001 Administrative Order on Consent (AOC) between the Parties and the USEPA. All sampling activities completed in association with this addendum were conducted in accordance with the AOC, the SOW, and the July 2002 *Remedial Investigation/Feasibility Study Work Plan* (the "RI/FS Work Plan"). In addition, the following documents, correspondence, and communications with the USEPA provide bases for the supplementary risk evaluations provided in this addendum:

- A meeting between the Parties and the USEPA held on November 18, 2005, as memorialized in a letter from John Ix, Esq. to USEPA dated November 29, 2004;
- The RI Report dated February 2005;
- USEPA letter to ENVIRON dated February 21, 2005 (copy included as Appendix A);
- Electronic mail transmission from USEPA to ENVIRON dated March 10, 2005, which contained a discussion of certain aspects of the RI Addendum scope of work;
- Electronic mail transmission from ENVIRON to USEPA dated March 10, 2005, which outlined the scope of additional on-site data collection for the RI Addendum;
- Electronic mail transmission from USEPA to ENVIRON dated March 10, 2005, which conditionally approved ENVIRON's data collection plan;
- A conference call held with the USEPA and the Parties on March 18, 2005 in which certain air modeling issues were discussed; and

- Subsequent correspondence with the USEPA concerning certain aspects of these supplemental risk evaluations.
- USEPA's comments on the initial draft of this report and responses prepared by ENVIRON (Appendix B).

Consistent with the overall goals of the RI, the primary objectives of the RI Addendum are to: (1) provide supplementary information concerning the nature and extent of contamination at the Site associated with the residue piles; (2) assess potential migration pathways from the residue piles by which the contaminants could potentially impact human or ecological receptors; and (3) evaluate potential risks to the receptors. The following documents, previously submitted to and approved by the USEPA, provide supporting documentation for certain aspects of the RI Addendum:

- *Preliminary Site Evaluation Report, March 2002* (the "PSE Report")
- *Technical Memorandum, Phase 1 - Source Characterization, March 2003* (the "Phase 1 Technical Memorandum")
- *Technical Memorandum, Phase 2 - Migration Pathway Assessment, November 2003* (the "Phase 2 Technical Memorandum")
- *Human Health Risk Assessment, August 2004* (the "HHRA")
- *Ecological Risk Screening Evaluation, August 2004* (the "ERSE")
- *Remedial Investigation Report, February 2005* (the "RI Report")

Finally, a memorandum prepared by CH2M Hill, Inc., on behalf of USEPA, entitled *Eagle Zinc Company Site- Review of Nature, Extent of Contaminants, and Risk Assessments* (the "CH2M Hill Memorandum") is incorporated in the RI Addendum by reference. This memorandum was transmitted to ENVIRON as an attachment to USEPA's December 22, 2005 comment letter on the first draft of this report.

B. Report Organization

Section I describes the purpose and organization of this report. Section II provides a summary of the physical characteristics of the residue piles. Section III describes supplementary on-site data collection conducted in March 2005. Section IV presents a discussion of air modeling and deposition calculations performed to estimate potential impacts from the residue piles. Section V presents a supplemental human health risk evaluation for the residue piles. Section VI presents a supplemental ecological risk screening evaluation for the residue piles. Section VII presents the overall conclusions of the RI Addendum.

II. RESIDUE PILE CHARACTERIZATION

A. Physical Characterization of Residue Piles

Residual materials were historically generated at the Site from rotary kiln and smelting operations conducted to refine zinc and to produce zinc products. The residual materials were generally placed in stockpiles located in areas west and southwest of the main plant area. As discussed in the PSE Report, residue pile types were established based on physical characteristics of the materials and knowledge of the manufacturing processes by which the residue piles were generated.[1] The residue pile types include: Rotary Residue Type 1 (RR1), Rotary Residue Type 2 (RR2), Rotary Clean Out (RCO), Rotary Residue Oversize (RRO), Carbon Plant Hutch (CPH), and Miscellaneous Piles (MP). Several additional piles were identified during Phase 1 of the RI.[2] Fifteen (15) residue piles or groups of piles were sampled during Phase 1 of the RI for analysis of Resource Conservation and Recovery Act (RCRA) Metals by the Toxicity Characteristic Leaching Procedure (TCLP) and the Synthetic Precipitation Leaching Procedure (SPLP). These 15 piles/pile groups were also sampled for Target Analyte List (TAL) metals and particle size distribution analysis in March 2005.

The piles generally consist of zinc processing slag with larger size particles (up to greater than 12 inches in diameter), with or without a finer grained matrix. An exception is the CPH material, which was observed to consist primarily of particles with diameters in the range of 0.2 to 0.5 inches. The consistency of the piles ranges from loose and disaggregated to highly compacted (fused, rock-like material). The residue piles range in height from approximately one foot to approximately 25 feet. A photographic log of the 15 piles/pile groups is included in Appendix C. Surface area estimates for the piles are included on residue pile characterization forms provided in Appendix D.

B. Sampling Conducted

1. Pre-RI Off-Site Soil Sampling

In 1993, a series of 16 surface soil samples were collected by the Illinois Environmental Protection Agency (IEPA) at residential properties in the vicinity of the Site (samples X104 through X120). Two background surface soil samples were also collected by the IEPA in the nearby town of Butler, Illinois (samples

[1] Residue pile types were established during a sampling program conducted by Goodwin-Broms, Inc. (GBI) in May 1998.

[2] These newly identified piles (designated NP) were either not identified by GBI during its 1998 investigations, or were created subsequent to GBI's investigation through a carbon screening process formerly conducted at the Site.

X101-B/G and X-102-B/G). The IEPA off-Site soil data are presented in Table II-1. The IEPA off-Site residential soil sample locations, concentrations of the metals in these samples that were identified as constituents of potential concern (COPCs) in the investigation phases of the RI, and a superimposed wind-rose diagram are shown in Figure II-1. With the exception of arsenic, iron, and manganese, all metals concentrations in the off-Site soil samples were below conservative USEPA screening levels for residential soils (USEPA Region III Risk-Based Concentrations [RBCs]). Arsenic concentrations detected in the off-Site soil samples were less than, or very close to, the average regional Illinois background level (11.3 milligrams per kilogram [mg/kg]), taken to be the non-Metropolitan Statistical Area (MSA) background value presented in the Illinois Tiered Approach to Corrective Action Objectives (TACO), see Table II-1. The 95% upper confidence limit (UCL) for arsenic in off-Site soils was below the non-MSA value. Arsenic was not used as a raw material in the historical zinc processing operations conducted at the site; however, arsenic may have been present as an impurity in coal used in the manufacturing processes. Iron and manganese marginally exceeded the RBCs in two of the 16 off-site soil samples. However, the 95% UCLs for iron and manganese in off-Site soils were below the non-MSA values.

IEPA's findings were interpreted in a letter dated February 22, 1994 from Mr. K. D. Runkle of the Illinois Department of Public Health (IDPH) to Mr. Brad Taylor of IEPA's Site Assessment Unit. The IDPH letter stated that the soil data collected by IEPA at off-Site Residences indicate "no apparent health concern." This opinion was also conveyed to the residents whose properties had been sampled.

2. Sampling Conducted During the RI

In addition to the TCLP and SPLP metals analyses noted above, potential impacts from the residue piles were investigated through the collection and analysis of soil, sediment, surface water, and ground water samples, both on-site and off-Site. The nature and extent of contamination of soil, sediment, surface water and ground water associated with the residue materials, as well as potential risks to human and ecological receptors, were characterized in the RI Report.

Soil investigation areas for the RI were established in the SOW and RI/FS Work Plan, including Areas 1 through 4, the Manufacturing Area, the Northern Area, and the Western Area. Areas 1 through 4 were identified by GBI in May 1998 for the purpose of grouping soil samples within areas exhibiting similar physical characteristics, principally areas containing significant concentrations of residue piles. The thickness of residue materials observed at each soil boring location is provided in Table III-1 of the RI Report. As indicated in this table, 22 of the 27 soil boring locations for which soil samples were submitted to the laboratory contained some surface residue material. A map highlighting all soil borings that encountered surface residue is provided as Figure II-2. In accordance with the approved sampling protocol, all soil samples were collected from the uppermost 12 inches of undisturbed native soil.

In the SOW and RI/FS Work Plan, the number of soil borings conducted and frequency of soil samples collected in each area were based on the potential for soil impacts. The largest numbers of soil borings were conducted in Areas 1 through 4, which currently/historically contain(ed) the largest concentrations of residue piles. Twenty-six soil borings were conducted in each of these areas. In all areas, the soil boring locations were randomly selected in accordance with USEPA-approved methodology. Many of the soil borings were collected in close proximity (within approximately 50 feet) to residue piles. The soil samples were collected from the uppermost interval of undisturbed native soil to address potential impacts from the residues.

As discussed in the Phase 2 Technical Memorandum, ENVIRON sampled eight pre-existing monitoring wells, as well as 11 permanent and three temporary monitoring wells installed during Phase 2 of the RI. All of the ground water sample analyses included TAL metals (total and dissolved). The monitoring well locations include areas both proximal to, and down gradient of, the areas with the largest concentrations of residue piles (i.e., Areas 1 through 4). Similarly, sediment and soil samples were collected during the RI at locations within the eastern and western surface water drainageways that are both within and hydraulically down gradient of the areas containing residue piles.

The SPLP data collected from the residue piles during the RI were generally non-detect or indicated very low metals leachate concentrations. While the higher concentrations of metals detected in ground water exist within and down gradient of areas containing residue piles (i.e., in the southwestern portion of the Site), the SPLP data indicate that the residue piles do not represent a significant continuing source of metals to ground water.

In summary, the degree of mobility of metals contained in the residue piles was evaluated in existing soil, sediment, surface water, and ground water data collected during the RI, as well as pre-RI data. These media data were used to estimate potential risks to defined human and ecological receptor populations. Existing on- and off-site soil data represent the sum of release, transfer, and deposition processes related to facility operations and waste management for the past approximately 90 years.

3. Sampling Conducted During March 2005

Physical characterization and chemical analyses of the residue piles were conducted in March 2005 and are discussed further in Section III.A. Additional surface soil samples were collected near the northern Site boundary and in the southern portion of the Site in March 2005. These soil samples are discussed further in Section III.B.

C. Residue Pile Conceptual Models

Conceptual models for potential human health and ecological exposure pathways associated with the residue piles are discussed in detail in Sections V and VI of this report, respectively.

III. DATA COLLECTION

A work plan for the collection of soil and residue samples associated with the RI Addendum was transmitted to USEPA in an electronic mail transmission on March 10, 2005. In an electronic mail transmission to ENVIRON on March 10, 2005, USEPA required the collection of four additional surface soil samples in the southern area of the site. The additional soil and residue pile samples were collected at the Site in March 2005. All sampling activities were conducted in accordance with the USEPA-approved sampling methods and quality assurance protocol specified in the RI/FS Work Plan and employed during previous phases of the RI. All chemical analyses were performed by the Enchem, Inc. laboratory in Green Bay, Wisconsin. The particle size analyses were performed by STS Consultants, Ltd. of Vernon Hills, Illinois. Data validation was performed by Trillium, Inc. of Baton Rouge, Louisiana. The laboratory data and data validation reports are submitted under separate cover.

The data collection activities are described below. Sampling information regarding the soil and residue samples collected in March 2005 is provided in Tables III-1 and III-2, respectively. The sampling locations are depicted on Figure III-1.

A. Residue Pile Sampling and Analysis

1. Work Conducted

The following residue pile inspections and sampling activities were conducted on March 11, 2005:

Physical Characterization

Estimates of the degree of crusting/armoring of the residue piles as well as estimates of the percentage of particles constituting "non-erodible elements" (i.e., greater than 1 centimeter in diameter) were made using the methodology specified by Cowherd et al. (1985). This information, as well as other physical characteristics of the piles, is provided on residue pile field forms, included in Appendix D. Eight of the 15 piles/pile groups exhibited crusting/consolidation of surface material. Where cross-sectional views through the piles were available, the crusting/consolidation generally extended all the way through the pile (i.e., the entire pile was hard and consolidated). For piles that were crusted/consolidated, the only loose material was observed on the top and sides of the pile.

TAL Metals Analysis

One residue sample was collected from each of the 15 piles/pile groups that were sampled in Phase 1 of the RI. The residue samples were collected from non-crusted portions of the piles, which would be expected to have the greatest potential for emission of particulates. Consistent with the methodology used in the RI, each sample was a composite of six sample increments of approximately equal volumes. The sample increments were spaced evenly across the piles/pile groups and were biased towards smaller-sized material (i.e., large cobble-size particles were not sampled). Each sample increment was collected from the outermost two to three inches of the pile. The sample increments were thoroughly mixed before placement in the sample containers. In addition, the fine-grained fraction from each residue grab sample analyzed for particle size (i.e., the <75 micron [μm] size fraction that passed a #200 sieve) was combined at the Enchem laboratory into a single composite sample (sample designated "Composite Sample"). Each residue sample, including the composite sample, was analyzed for TAL metals. Field duplicate and matrix spike/matrix spike duplicate (MS/MSD) samples were also collected and analyzed.

Particle Size Distribution

A representative surface grab sample was collected from each residue pile/pile group for particle size distribution and moisture content analyses. The grab samples collected for particle size distribution and moisture content analysis were not collected at the same locations as the increment samples used for the TAL metals composite samples, but were collected from representative surface material from each pile. The particle size samples were generally collected at the top of each pile.

2. Analytical Results

The TAL metals analytical results for the residue pile samples and composite sample are presented in Table III-3. The particle size distribution data for the residue pile samples are presented in Appendix E.

B. Supplementary Soil Sampling

1. Work Conducted

On March 11, 2005, four surface soil samples (depth of 0-0.5 feet below ground surface [bgs]) were collected near the northern Site boundary for analysis of TAL metals. These samples were collected approximately 100 feet south of the northern Site boundary, at approximately equally spaced intervals parallel to Smith Road, see Figure III-1. A field duplicate sample and MS/MSD samples were also collected and analyzed.

On March 16, 2005, four additional on-site surface soil samples were collected at specific locations in Areas 1 and 2 for TAL metals analysis.[3] As specified by USEPA, these samples were located:

- Near the location of Phase 1 soil boring A1-3,
- At a location approximately mid-way between Phase 1 soil borings A1-1 and A1-25,
- Near the location of Phase 1 soil boring A2-3, and
- Near the location of Phase 1 soil boring A2-13.

All of these samples were collected from the ground surface (0-0.5 feet bgs). However, as surface soil sample A1-3-S1 contained a mixture of soil and residue materials, a second soil sample (A1-3-S1-2) was collected at the same location, but at a depth of 0.5 to 1.0 feet bgs. This sample did not appear to contain any residue material. A field duplicate sample and MS/MSD samples were also collected and analyzed.

2. Analytical Results

Surface soil analytical results are presented in Table III-4. For screening purposes, the data were compared with USEPA Region III Risk-Based Concentrations (RBCs) for Residential Soils.

Northern Area

As shown in Table III-4, no metals concentrations exceeded USEPA Region III's RBCs for Residential Soil in the Northern Area samples. Therefore, as concluded in the RI Report, soils in the Northern Area at locations down-wind

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[3] Collection of these additional samples was requested by USEPA in an electronic mail transmission dated March 10, 2005.

of the residue piles and former manufacturing areas have not been significantly impacted by emissions from the residue piles or any other potential contaminant sources.

Areas 1 and 2

The arsenic concentrations detected in samples A1-26-S1 and A1-3-S1 (12 mg/kg and 21 mg/kg, respectively) exceed the Illinois background screening level of 11.3 mg/kg. Arsenic was not detected above the screening level in sample A1-3-S1-2, which was collected at the same location as sample A1-3-S1, but six inches deeper. No other metal concentrations exceeded USEPA Region III's RBCs for Residential Soil. As shown in Table III-4, metals concentrations in sample A1-3-S1 (contained visible residue material) were generally higher than those in sample A1-3-S1-2 (no visible residues; collected 6 inches deeper at the same location).

IV. AIR MODELING AND SOIL DEPOSITION CALCULATIONS

A. Introduction

To evaluate potential risks associated with windborne particles from the residue piles, emission rate calculations, dispersion modeling, and deposition calculations were performed. The methodology for determining emission rates was obtained directly from *AP 42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources,* Chapter 13.2.5, for Industrial Wind Erosion (USEPA, originally dated January 1995, updated April 2001).[4] The dispersion results, as well as the deposition concentration results (discussed in Section IV.D) are further analyzed for human health and ecological risk affects in Sections V and VI, respectively.

B. Emission Rate Calculations

ENVIRON developed the emission rates based on a conservative, "worst-case" approach. Further refinement of emission rates may be warranted if advanced modeling is required. Detailed calculations are provided per residue pile/pile group in Appendix F.

The protocol outlined below describes the steps used in developing the emission rates for each pile. The first three steps of the AP 42 protocol are generic to all piles, as the friction velocity is dependent on wind speed data and not individual pile characteristics.

1. Step 1 was to determine the threshold friction velocity. As a screening exercise, a conservative default value from AP 42 Table 13.2.5-2 was used. The threshold friction velocity for an uncrusted coal pile at 1.12 meters per second (m/s) was applied (**Assumption #1**). If refined modeling is required, pile-specific threshold friction velocities can be developed using particle size distribution data.

2. Step 2 included a determination on the frequency at which the piles are disturbed. Emissions generated by wind erosion are dependent on the frequency of disturbance of the erodible surface. Each time a surface is disturbed (moved, material added, deleted, or leveling of pile); the erosion potential is restored because the action results in the exposure of fresh surface material. As the residue piles have been inactive for a number of years and access to the Site itself is limited to authorized personnel only, ENVIRON had

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[4] This information is available on the USEPA Clearinghouse for Inventories & Emissions Factors website: http://www.epa.gov/ttn/chief/ap42/index.html#drafts.

to be conservative and use a hypothetical disturbance frequency. ENVIRON calculated emission rates based on a maintenance disturbance of once per month. Therefore, the number of annual disturbances was set to 12 (**Assumption #2**). Again, to err on the conservative side, it was assumed that the ***entire*** pile surface area is disturbed once per month (**Assumption #3**).

3. Step 3 involved tabulating the fastest mile values for each frequency of disturbance. ENVIRON used readily available wind speed and direction data from the meteorological surface station for the Springfield, Illinois Airport (Station #93822). The base year of 1987 was validated and directly available for use from the Springfield Airport, and thus served as the fastest mile reference year. For each month in the one-year (1987) meteorological data set, the maximum wind speed and its corresponding direction were tabulated as the fastest mile for that month. Since the anemometer height for the Springfield Airport is 9.45 meters (m), it was necessary to correct the fastest mile values to an anemometer height of 10 m, using Equation (5) from AP 42 Chapter 13.2.5. Equation (5) requires a roughness height value. ENVIRON used the default or typical roughness height of 0.5 centimeters (**Assumption #4**).

4. Step 4 included converting the fastest mile values to equivalent friction velocities, taking into account the uniform or non-uniform wind exposure of elevated surfaces.

    i. Height-To-Base Ratio
    ENVIRON first determined the height-to-base ratio of each pile to determine if the pile significantly penetrates the surface wind layer (height-to-base ratio exceeding 0.2) and, therefore, creates a non-uniform wind exposure pattern. If the ratio exceeded 0.2, it was necessary to divide the pile area into sub-areas representing different degrees of exposure to wind. If the height-to-base ratio was 0.2 or less, AP 42 specifies an assumed uniform exposure to wind is generated.

    ii. Uniform Wind Exposure Pattern
    A uniform wind exposure pattern eliminated the need to divide each pile into sub-areas. Therefore, a single equation is applied in the uniform case. Friction velocity is calculated using AP 42 Chapter 13.2.5

Equation (4). If the calculated friction velocity is greater than the threshold friction velocity of 1.12 m/s, then erosion will occur and it is necessary to determine the erosion potential (Step 5 below). However, if the calculated friction velocity is 1.12 m/s or less, then the potential for wind erosion of that pile is negligible. Those piles determined with negligible friction velocities, i.e., no emission rate, were not modeled using SCREEN3 (see Section IV.B).[5]

iii. Non-Uniform Wind Exposure Pattern

AP 42 divides piles into two general shapes (circular and oval) with four corresponding surface contours of normalized surface wind speeds. The shape of the contours for similarly shaped piles is dependent on the wind direction. For each fastest mile and corresponding wind direction, ENVIRON matched the applicable contour map from AP 42 Figure 13.2.5-2, which dictates the ratio of surface wind speed (Us) to approach wind speed (Ur) and matches an appropriate percent of the surface area subject to the applicable Us/Ur ratio. The result was used to determine the friction velocities per Us/Ur ratio.

If the non-uniform wind exposure pattern exists, ENVIRON determined the friction velocities within each isopleth values of Us/Ur. Friction velocity is calculated per disturbance per Us/Ur ratio and per fastest mile, using Equations (6) and (7) from AP 42 Chapter 13.2.5. If the calculated friction velocity is greater than the assumed threshold friction velocity of 1.12 m/s, then erosion will occur and it is necessary to determine the erosion potential (Step 5). However, if the calculated friction velocity is 1.12 m/s or less, then the potential for wind erosion of that pile is negligible. Those piles determined with negligible friction velocities, i.e. no emission rate, were not modeled using SCREEN3 (see Section IV.C).

5. Treating each sub-area (of constant frequency of disturbance and friction velocities) as a separate source, ENVIRON calculated the erosion potential for

[5] SCREEN3 is an USEPA approved single source Gaussian plume model which provides maximum ground-level concentrations for point, area, flare, and volume sources, as well as concentrations in the cavity zone, and concentrations due to inversion break-up and shoreline fumigation.

each period between disturbances. Equation (3) from AP 42 Chapter 13.2.5 was used to determine the erosion potential per Us/Ur ratio.

6. Finally, particulate emissions were calculated by multiply the resulting erosion potential for each sub-area by the size of the sub-area and the applicable particle size multiplier. The emission contributions of all sub-areas are then added to determine the overall pile particulate emission rate for various sized particles. Namely, an emission rate was determined for particles 30 micrometer (μm or micron) or less, 15 μm or less, 10 μm or less, and 2.5 μm or less.

C. Dispersion Modeling

As a screening evaluation, dispersion modeling was conducted using SCREEN3. Modeling was performed using the BREEZE software interface, licensed to ENVIRON by Trinity Consultants (BREEZE AIR SCREEN3 Version 2.04).

As communicated to USEPA prior to the initiation of modeling, the following control options were applied:

- Rural dispersion coefficients
- Regulatory default mixing height
- No fumigation
- No set distance to property line
- Full meteorology conditions
- Area source using the worst-case orientation
- Automated receptor grid from 1 m (absolute minimum value that can be inputted into SCREEN3) to 1,610 m (1 mile)
- No building downwash

As discussed above, the rate of particulate emissions from the residue pile is specific per pile and per particle size. The emission rates corresponding to a 10 μm particle size were used for the inhalation pathway risk assessment, while the emission rates corresponding to a 30 μm particle size were used for the deposition evaluation.

In addition, a number of residue piles were identified with a calculated friction velocity at or below the threshold friction velocity of 1.12 m/s, thus indicating that the potential for wind erosion of the pile is negligible. Those piles determined with negligible friction velocities, i.e., no emission rate, were not modeled using SCREEN3, as an emission rate greater than zero is required to run the model. In all cases where the emission rate was calculated to be negligible, field observations indicated that the pile did not significantly penetrate the surface wind layer due to a height-to-base ratio less than 0.2.

The SCREEN3 dispersion modeling results per residue pile per particle size are presented in Tables IV-1 and IV-2. The SCREEN3 output files are provided in Appendix G and a detailed summary of 1-hour concentrations versus distance from the pile is provided in Appendix H. SCREEN3 results are presented as 1-hour average concentrations, as SCREEN3 is not capable of determining annual average concentrations.[6]

D. Deposition Calculations

Soil concentrations in the upper 0- to 6-inch soil horizon were calculated following the methodology outlined in Chapter 5 of the USEPA's *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities*.[7] The deposition flux was estimated using the maximum air concentration calculated using SCREEN3 for each pile. A Stoke's Law settling velocity was calculated assuming a 30 μm diameter particle. The source and values for all input parameters are presented in Table IV-3. The soil-water partition coefficient for each pile/pile group and TAL metal can be found in Table IV-4. For the eight RCRA metals, the SPLP data collected during Phase 1 of the RI and the metals data collected for the RI Addendum sampling were used as model input. For all other metals, literature values for metals in soil were used as model input values.

Soil concentrations for carcinogens and non-carcinogens were calculated using the following equations:

Carcinogens:

For $T_2 \leq tD$:

$$Cs = \frac{Ds}{ks \cdot (tD - T_1)} \cdot \left[\left(tD + \frac{\exp(-ks \cdot tD)}{ks} \right) - \left(T_1 + \frac{\exp(-ks \cdot T_1)}{ks} \right) \right]$$

[6] According to USEPA, multiplying factors for "area" sources have not been developed to correctly adjust 1-hour concentrations to annual average concentrations. For fugitive sources modeled with the "area" source algorithm in SCREEN3, USEPA guidance recommends that the maximum 1-hour concentration be conservatively assumed to apply to averaging periods out to 24 hours.

[7] USEPA, 1999a. Methodology suggested in USEPA's letter to ENVIRON dated February 21, 2005.

For $T_1 < tD < T_2$:

$$Cs = \frac{\left(\frac{Ds \cdot tD - Cs_{tD}}{ks}\right) + \left(\frac{Cs_{tD}}{ks}\right) \cdot (1 - \exp[-ks \cdot (T_2 - tD)]}{(T_2 - T_1)}$$

Noncarcinogens:

$$Cs_{tD} = \frac{Ds \cdot [1 - \exp(-ks \cdot tD)]}{ks}$$

where:

Cs = Average soil concentration over exposure duration (mg /kg soil)[8]
Ds = Deposition term (mg /kg soil/yr)
T_1 = Time period at the beginning of deposition (yr)
ks = soil loss constant due to all processes (yr^{-1})
tD = Time period over which deposition occurs(yr)
Cs = Soil concentration at time *tD* (mg/kg)
T_2 = Length of exposure duration (yr)

The soil loss constant due to all processes was calculated using the following equation:

$$ks = ksr + ksl$$

where:

ks = soil loss constant due to all processes (yr^{-1})
ksr = loss constant due to surface runoff (yr^{-1})
ksl = loss constant due to leaching (yr^{-1})

The loss constant due to surface runoff was calculated using the following equation:

$$ksr = \frac{RO}{\theta_{sw} \cdot Z_s} \cdot \left(\frac{1}{1 + (Kd_s \cdot BD / \theta_{sw}}\right)$$

where:

ksr = COPC loss constant due to surface runoff (yr^{-1})
RO = Average annual surface runoff from pervious areas (cm/yr)
θ_{sw} = Soil volumetric water content (mL water/cm^3 soil)
Z_s = Soil mixing zone depth (cm)
Kd_s = Soil-water partition coefficient (mL water/g soil)
BD = Soil bulk density (g soil/cm^3 soil)

The loss constant due to leaching was calculated using the following equation:

$$ksl = \frac{P + I - RO - E_v}{\theta_{sw} \cdot Z_s \cdot [1 + (Kd_s \cdot BD / \theta_{sw}]}$$

where:

ksl = loss constant due to leaching (yr^{-1})
P = Average annual precipitation (cm/yr)
I = Average annual irrigation (cm/yr)
RO = Average annual surface runoff from pervious areas (cm/yr)
E = Average annual evapotranspiration (cm/yr)
θ_{sw} = Soil volumetric water content (mL water/cm^3 soil)
Z_s = Soil mixing zone depth (cm)
Kd_s = Soil-water partition coefficient (mL water/g soil)
BD = Soil bulk density (g soil/cm^3 soil)

The runoff term was calculated by the soil conservation method (SCS) as presented in Novotny, 1994:

$$RO = \frac{(P - I_a)^2}{(P - I_a) + S}$$

where:

RO = Average annual surface runoff from pervious areas (cm/yr)
P = Annual precipitation (cm/yr)
I_a = Total infiltration (cm/yr)
S = Initial abstraction (cm/yr)

$$I_a = 0.2 \cdot S$$

and

$$S = \frac{25{,}400}{CN} - 254$$

where:

CN = the runoff curve number

The deposition term was calculated using the following equation:

$$Ds = \frac{M}{Z_s \cdot BD} \cdot 31536000 \cdot 1 \times 10^{-6}$$

where:

Ds = Deposition term (mg /kg soil/yr)

M = Deposition flux (μg /m^2/sec)

1×10^{-6} = Units conversion factor ($\frac{m^3 \cdot g \cdot mg}{cm^3 \cdot kg \cdot \mu g}$)

31536000 = Units conversion factor (sec/yr)

Z_s = Soil mixing zone depth (m)

BD = Soil bulk density (g soil/cm^3 soil)

The deposition flux was calculated by the following equations:

$$M = C_{COPC,air} \cdot v_s$$

where:

M = Deposition flux (μg/m^2/sec)

$C_{COPC,air}$ = Concentration in air (μg/m^3)

v_s = Stoke's settling velocity (m/s)

The Stoke's settling velocity was calculated using the following equation:

$$v_s = \frac{g}{18\upsilon}\left(\frac{\rho_p - \rho_f}{\rho_f}\right)d_p^2$$

where:

ν_s = Stoke's settling velocity (m/s)

g = Gravitational acceleration (m^2/s)

υ = Kinematic viscosity of air at 25°C (m^2/s)

ρ_p = Density of the particle (kg/m^3)

ρ_f = Density of air at 25°C (kg/m^3)

d_p = Diameter of the particle (m)

E. Nature and Extent of Impacts Based on Modeling

The results of the deposition calculations are presented in Tables IV-5 and IV-6. Based on the methods employed, these results are assumed to be a conservative estimation of potential impacts to surface soils resulting from deposition of windblown particles from the residue piles onto the soil surface. These results are used in the risk assessments presented in Sections V and VI.

In the section of the CH2M Hill Memorandum entitled Updated Air Pathway Analysis, a SCREEN3 modeling exercise is described, which assumes that each pile is graded and spread to a uniform thickness of 6 inches and there is an "unlimited" reservoir of highly erodible soil. The modeled air concentrations were determined using metals data from a single sample containing <75 micron particles of residue and an assumption that this size fraction covers all surfaces exposed to wind erosion.[9] Based on this analysis, CH2M Hill concludes that "...emissions from the piles after they had been disturbed would result in only slightly elevated concentrations in surrounding soils." This conclusion is not significantly different from that drawn by ENVIRON.

[9] This size fraction comprises only 2-5% of the residues by weight.

V. HUMAN HEALTH RISK EVALUATION FOR RESIDUE PILES

This section presents an addendum to the Human Health Risk Assessment (HHRA) for the Site that was provided in Section VI of the RI Report. As indicated in the RI Report Figure VI-I, the HHRA was premised on the assumption that the residue piles constitute a source of metals to potential exposure media (soil and ground water). The fact that low risk levels were associated with on-site soil provides strong evidence of the lack of significant impact associated with past and ongoing material transport from the residue piles.

The additional material presented in this section has been developed specifically to address issues and questions raised in comments from USEPA communicated subsequent to the submission of the RI Report. In particular, USEPA expressed concern regarding potential human contact with airborne dust from the piles and with dust deposited on adjacent area soils. In its letter of February 21, 2005, USEPA requested that potential exposure and risks associated with the following potential transport mechanisms be considered in the RI Addendum:

- Suspension of wind-blown dust to soils in on- or off-Site locations, and
- Leaching of residue-associated metals to surrounding soils.

In addition, in its letter of December 22, 2005, USEPA requested the evaluation of potential exposures and risks associated with incidental ingestion of and dermal contact with residue pile material.

In order to address these concerns, samples of residue material as well as supplementary soil samples were collected and analyzed for TAL metals (discussed in Sections III.A and III.B). Modeling of the following transport processes was also performed:

- Aerial emission of particulate matter (PM) from residue piles (Section IV.B);
- Dispersion of suspended PM (Section IV.C); and
- Deposition of PM in surrounding areas and incorporation into the top six inches of soil (Section IV.D).

Because this is an addendum to the RI, information already presented as part of the HHRA in the RI Report will not be repeated herein, except as necessary to provide the additional information and analysis requested by USEPA. This HHRA addendum was conducted in a manner consistent with the RI/FS Work Plan, the RI Report, and appropriate USEPA guidance used in these documents (USEPA, 1989, 2002a).

For the exposure pathways related to air, hypothetical exposure concentrations were constructed using a series of conservative screening models (as described previously). Therefore, the results of this assessment are likely to overestimate potential risks. In addition, as with the methodology used for calculating emission rates in the deposition modeling, which included disturbance of the entire pile surface area 12 times per year, the assessment of risks related to the air pathways takes into consideration the long-term consequences of movement/relocation of the piles to on-site workers and trespassers.

The exposure of receptors working at the site was considered in the CH2M Hill Memorandum, in which residue data are compared with industrial and construction worker PRGs (Tables 11 and 13 in the memorandum, respectively). The risk analysis conducted by CH2M Hill for construction showed that the potential risks to those receptors would be less than the potential risks to industrial workers. Therefore, the results of the human health risk assessment presented below, which are focused on industrial workers, provide information that can also be used to address the protection of construction workers.

A. Potentially Complete Exposure Pathways

Potentially complete exposure pathways associated with emissions from or disturbance of the residue piles and the strategy used to address them in this Addendum are summarized in Table V-1. These potential exposure pathways include:

- Inhalation of respirable (≤10 μm aerodynamic diameter) particles emitted from the residue piles;
- Ingestion and dermal contact with surface soil.
- Inhalation of respirable particles from the surface soil; and
- Ingestion of and dermal contact with residue materials;

B. Selection of Constituents of Potential Concern in Soil

1. Selection of Constituents of Potential Concern in Soil Based on Air Modeling

As described in Section IV.D., air modeling results were used to estimate the concentrations in soil resulting from the deposition of particulates originating from the residue piles. Analytes that are common constituents of the earth's crust and are considered essential nutrients (i.e., calcium, iron, magnesium, potassium, and sodium; USEPA, 1989) were eliminated from consideration. Maximum modeled concentrations of other analytes in soils (Section IV.D) were compared with conservative screening levels to identify analytes that may be of concern (constituents of potential concern, COPCs) as described in Section II.B. of the RI Report, see Table V-2. The screening levels used in this evaluation were the higher of Illinois background levels (if available) and USEPA Region III's RBCs for the default residential exposure scenario (USEPA Region III, 2005).

The maximum modeled concentrations did not exceed any of the COPC screening levels, see Table V-2. Therefore, it is concluded that airborne deposition of residue pile material on local soils would not result in any adverse health effects.

2. Selection of Chemicals of Potential Concern in Soil Based on Samples Collected in March 2005

As described in Section III.B, additional soil samples were collected on-site in March 2005 (see Table III-4). Like the modeled results, the maximum detected concentration of each analyte in these samples was compared to corresponding COPC screening levels (see Table V-3). The only analytes with maximum concentrations in excess of a residential RBC or background concentration were arsenic, iron, lead, and vanadium. With the exception of lead, all of these analytes were also identified as soil COPCs in the HHRA (see RI Report Table VI-3).

C. Calculation of Residue Pile Screening Levels for Dust Inhalation

Residue pile screening levels (RSLs) for inhalation of airborne particles originating from the piles were calculated for each pile in accordance with the following equation from USEPA guidance (USEPA 2002a):

$$RSL_{Inh/RP} = \frac{THQ \text{ or } TR \cdot AT_{nc} \text{ or } AT_{c}}{{}^{1}\!/_{RfC} \text{ or } URF \cdot EF \cdot ED \cdot \left({}^{1}\!/_{PEF_{RP}} \right)}$$

This is the same equation as was used in the HHRA (RI Section VI.E.1.c, Equation 5). Equation parameters and their values are presented in Tables V-4 and V-5. However, here the default particulate emission factor (PEF) is replaced with residue pile-specific PEFs (PEF_{RP}) calculated by inverting the maximum modeled one-hour 10 μm particle concentration (see Table IV-1), and converting the units to kg/m^3:

$$PEF_{RP} = \frac{1}{\text{Maximum Modeled Air Concentration}} \cdot 10^9 \frac{\mu g}{kg}$$

As indicated in Table V-5, a number of analytes lacked toxicity criteria; therefore, no RSL could be estimated for them. Residue pile-specific PEFs and RSLs are presented in Table V-6. In several cases, an RSL greater than 1,000,000 mg/kg was calculated, indicating that no concentration of that metal in the pile could result in unacceptable risk.

D. Residue Pile Risk Characterization

1. Potential Risks Associated with Direct Soil Contact Based on March 2005 Soil Data

The concentrations of arsenic, iron, lead, and vanadium detected in the soil samples taken in March 2005 (Table III-4) are similar to those previously taken at the Site. Comparisons of the individual soil concentrations with the corresponding minimum Tier 1 screening levels developed for the industrial worker, construction worker, and trespasser scenarios in the HHRA (RI Report Tables VI-7 through VI-9) are presented in Tables V-7, V-8, and V-9, respectively. For lead, which was not selected as a COPC in the HHRA (RI Report Table VI-3), USEPA's recommended adult (actually, fetal) screening level of 1,288 mg/kg was used (USEPA 2002b). Although the Trespasser scenario involves 12- to 17-year olds rather than pregnant adults, application of this value to the Trespasser is considered more appropriate than that for the young residential child (400 mg/kg) (USEPA 1994) due to their greater similarities in terms of exposure potential and physiology. As in the HHRA, with the exception of arsenic for the industrial worker scenario, none of the March 2005 sampling results exceeded Tier 1 screening levels.

The average concentration of arsenic in the new samples is 7.4 mg/kg. Combining these data with the data set used in the HHRA, a 95% upper confidence limit of 8.1 mg/kg was estimated using ProUCL (gamma distribution) (USEPA 2004), identical to the representative concentration used in the HHRA (RI Report Table VI-8). Therefore, the conclusion reached in the HHRA is reiterated here: "The fact that the representative concentration for arsenic of 8.09 mg/kg is less than the Illinois background concentration of 11.3 mg/kg indicates that this slight exceedance of the target risk level is insignificant."

2. Potential Risks Associated with Inhalation of Respirable Particles Emitted by Residue Piles

The RSLs for each residue pile are compared to the residue pile analytical sample results, see Table V-10. In all cases, the concentrations detected in the residue piles are smaller than the RSLs, indicating that no adverse effects are expected due to the inhalation of particles originating from the residue piles, even if the one-hour maximum concentration were inhaled constantly for 30 years.

3. Potential Risks Associated with Exposure to Residue Pile Material

To evaluate potential risks that might be associated with exposure to the material comprising the residue piles, the data for the piles were compared to USEPA Region III default RBCs for commercial/industrial workers. As presented in Table V-11, the comparisons include data from the 15 residue piles, data from the composite residue pile sample representing the <75 micron size fraction, and available background data for Illinois. The results of the comparison show that the only constituents that exceed both the available background concentration and the Region III RBCs are arsenic and lead. Arsenic concentrations exceed the background-based screening level at eight of the piles, as well as in the <75 micron sample.[10] Lead concentrations exceed the criteria (using USEPA's criteria as the RBC, as described in the table) at four of the piles, as well as in the <75 micron sample. These results indicate that, for arsenic and lead only, unacceptable risks may be associated with commercial/industrial workers exposed to the materials in a few of the residue piles.

E. Conclusions

As discussed in the RI Report, the HHRA conducted for the Eagle Zinc Company Site was predicated on the assumption that the residue piles are an important historical and the only potential current source of COPCs at the site. At the direction of USEPA, the screening-level modeling effort documented in this addendum was undertaken in an effort to determine whether airborne emissions from the piles and direct contact with the piles could, under worst-case assumptions, result in unacceptable human exposure and risk. The conservative assumptions and models used in this HHRA Addendum are expected to result in overestimation of potential exposure and risk. The maximum modeled concentrations did not exceed any of the COPC screening levels; therefore, it is concluded that airborne deposition of residue pile material on local soils would not result in any adverse health effects. Secondly, with the exception of arsenic for the industrial

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[10] However, arsenic in residues at only four piles exceeds an RBC based on 10^{-5} cancer risk (19 mg/kg) and arsenic in residues at only one pile exceeds an RBC based on 10^{-4} cancer risk (190 mg/kg).

worker scenario, none of the March 2005 soil sampling results exceeded Tier 1 screening levels. Finally, the metal concentrations detected in the residue piles are less than the RSLs, indicating that no adverse effects are expected due to the inhalation of particles originating from the residue piles. Based on the analysis presented in the HHRA and this HHRA Addendum, it is concluded that, under current conditions, the risks associated with exposure to environmental media at the Site and potentially respirable particles from the residue piles are acceptable.

Comparison of metals concentrations in the residue piles with USEPA Region III default RBCs for commercial/industrial workers indicates that only arsenic and lead exceed both the available background concentration and the Region III RBCs. Arsenic concentrations exceed the background-based screening level at eight of the piles, as well as in the <75 micron sample. However, significantly fewer piles contain arsenic concentrations that exceed RBCs based on 10^{-5} and 10^{-4} cancer risk. Lead concentrations exceed the criteria (using USEPA's criteria as the RBC, as described in the table) at four of the piles, as well as in the <75 micron residue sample. These results indicate that, for arsenic and lead only, unacceptable risks may be associated with long-term ingestion and dermal contact by commercial/industrial workers for some of the residue piles.

Finally, with respect to the hypothetical future scenario that was evaluated by CH2M Hill in their Memorandum, CH2M Hill concluded that unacceptable risk may be associated with ingestion and dermal contact by commercial/industrial workers, construction workers, and trespassers with respect to arsenic, lead, and zinc if:

- The residue piles are regraded such that fine residues are dispersed over the entire surface of the site and in the drainageways; and
- The exposure concentrations for all residues are equal to the concentrations in the single Composite Sample (sample containing <75 micron size fraction).

VI. ECOLOGICAL RISK SCREENING EVALUATION

This section presents an addendum to the Ecological Risk Screening Evaluation (ERSE) for the Site that was provided in Section VII of the RI Report. The additional material presented in this section has been developed specifically to provide insight into issues and questions raised in comments from USEPA communicated subsequent to the submission of the RI Report. In particular, USEPA expressed concerns related to terrestrial ecological receptors and their potential exposures to constituents in on-site residue piles that may be transported away from the piles. In its comments, USEPA stated that the following needed to be considered in the RI Addendum:

- Transport – Uptake and accumulation of residue pile particulates via wind
- Exposure Media – Air, residue pile particulates in soil, and tissue
- Exposure Routes – Inhalation, ingestion, direct contact, and root uptake
- Terrestrial Receptors –Deer mouse, robin, and red-tailed hawk (i.e., the terrestrial receptors evaluated in the RI)

In addition, the exposure of ecological receptors to constituents present in the <75 micron sample was considered in the CH2M Hill Memorandum, in which it was assumed that the <75 micron fraction of the residue pile material was present throughout the site and drainageways. This evaluation assessed risks related to terrestrial and aquatic habitats.

Because this is an addendum to the RI, information already presented as part of the ERSE in the RI Report will not be repeated herein, except as necessary to provide the additional information and analysis requested by USEPA.

This ERSE addendum was conducted in a manner consistent with the RI/FS Work Plan, the RI Report, and appropriate USEPA guidance (USEPA 1997; 1998; 2000; 2001a). However, unlike a standard baseline risk assessment, current Site data have not been used. Rather, hypothetical Site data have been constructed using models (see Section IV). These modeled data serve as input to this ERSE addendum. This ERSE addendum consists of the following steps, abbreviated as appropriate with regard to information previously presented in the RI Report:

- Step 1: Screening-Level Problem Formulation and Ecological Effects Evaluation
- Step 2: Screening-Level Preliminary Exposure Estimate and Risk Calculation

The ecological risk assessment (ERA) process produces a series of clearly defined scientific management decision points (SMDPs). These SMDPs represent critical steps in the process where ecological risk management decision-making occurs. The first SMDP of an ERA typically occurs after Step 2. Generally, the following types of decisions are considered at the SMDPs:

- Whether the available information is adequate to conclude that ecological risks are negligible and, therefore, there is no need for any further action on the basis of ecological risk.
- Whether the available information is not adequate to make a decision at this point, and the ecological risk assessment process will continue.
- Whether the available information indicates a potential for adverse ecological effects, and a more thorough assessment or remediation is warranted.

A. Step 1: Screening-Level Problem Formulation and Ecological Effects Evaluation

1. Screening-Level Problem Formulation

The problem formulation element of an ERA serves to define the reasons for the ERA and the methods for analyzing/characterizing risks, and provides information used to establish the overall goals, breadth, and focus of an ERA (USEPA, 1997; 1998). Once this information is established, it is used to develop a conceptual site model for the ERA.

Information pertaining to the screening-level problem formulation has been presented in detail in the RI Report. The comments received by USEPA are considered supplemental to the screening-level problem formulation in that they focus this ERSE addendum on consideration of: windblown particulates from residue piles; exposure via air, particulates in soil, and tissue by inhalation, ingestion, direct contact, and root uptake; and the previously-evaluated terrestrial receptors (deer mouse, American robin, and red-tailed hawk). These potential exposure scenarios, as identified by USEPA, are discussed below. The discussion includes information presented in the RI Report. The results of the information developed below are presented as the conceptual site model.

<u>Source and Transport of Constituents</u>

The source of COPCs is the residue piles located on the Site. The transport mechanism of interest for this ERSE addendum is windblown generation and entrainment of fugitive dust. Air dispersion and deposition modeling have been used to predict concentrations in ambient air and soil.

Exposure Media

The exposure media of potential interest are air, particulates in soil (hereafter referred to as soil), and tissue. Because effects due to exposure to airborne constituents are not well understood for ecological receptors, potential exposures via airborne transport will not be quantified in this addendum.[11] However, exposure to soil and tissue has been quantitatively evaluated as in the RI Report, as discussed below (specifically, via ingestion and food web modeling).

Exposure Routes

The exposure routes that will be quantitatively evaluated are consistent with the exposure media identified above, as well as the routes evaluated in the ERSE. Ingestion and vegetative root uptake, via food web modeling, will be quantitatively evaluated, while inhalation and direct contact will not be quantitatively evaluated. Inhalation is not evaluated for the reasons described previously. Direct contact exposure route is not evaluated because the receptors have dense fur or feathers and this exposure route was not evaluated in the ERSE.

Receptors

The receptors of interest are terrestrial, avian, and mammalian wildlife which, consistent with the ERSE, are the deer mouse, American robin, and red-tailed hawk.

Other elements identified in USEPA's comments that have been considered, insofar as they might impact the screening-level problem formulation, include bioavailability of the COPCs and the potential for exposure via windblown residue pile material being deposited on surface water features. One hundred percent bioavailability is conservatively assumed in this addendum, as in the RI Report. The ERSE shows clearly that water-related risks to terrestrial receptors represent less than one percent of the risk due to ingestion. Therefore, the effects of windblown materials or water-related risks will only be evaluated in this addendum via food web modeling (as in the ERSE).

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[11] USEPA's guidance pertaining to ecological risk relative to combustion facilities does not include inhalation as a quantified pathway (USEPA 1999a). Also, this medium was not evaluated in the RI Report.

A conceptual site model for potential ecological exposure pathways and media associated with the residue piles prepared using the information presented above is presented in Figure VI-1.

2. Screening-Level Ecological Effects Evaluation

The screening-level ecological effects evaluation involves the identification of appropriate ecotoxicity screening values (ESVs) for each medium. ESVs are chemical concentrations in environmental media below which there is negligible risk to receptors exposed to those media (USEPA, 2000). ESVs are available from a broad range of federal and state sources, one or more of which may be applicable for any given site. Further, ESVs for all media and all receptors may not be available from each source; thus, consideration of a range of sources provides greater opportunity for identification of ESVs. The ESVs used in this addendum are the same as those presented in the ERSE, and are described below. Toxicity values used in the ERSE and this addendum are presented in Table VI-1.

The terrestrial mammalian and avian No Observed Adverse Effects Levels (NOAELs) were summarized on Table VII-3 of the RI Report, with more complete documentation presented in Appendix D of the RI (Table D-1b and D-1c, for mammalian and avian receptors, respectively). The avian and mammalian NOAELs are based on the compilation of Sample et al. (1996). These NOAELs are based on chronic exposures to wildlife, and reflect values where diminished survival or diminished reproductive capacity would not be expected, and are based on species-specific food web modeling calculations.

Further, mammalian NOAELs from Sample, et al. (1996) required mathematical extrapolation to provide estimates of deer mouse NOAELs. These mathematical formulae were described in Appendix D, Tables D-1b and D-2a of the RI Report. Avian NOAELs do not require a similar mathematical extrapolation (Sample, et al., 1996). The avian NOAELs are the same, regardless of avian species. The same NOAELs are used for both the American robin and the red-tailed hawk, even though based on a mallard duck study, as identified in Appendix D, Table D-1c of the RI Report.

B. Step 2: Screening-Level Preliminary Exposure Estimate and Risk Calculation

Typically, Step 2 consists of the identification of exposure concentrations and calculation of exposure, followed by the calculation of risk and evaluation of uncertainties. A streamlined approach to developing this information is presented in this addendum, wherein the maximum concentrations estimated by the dispersion and deposition modeling are used for exposure concentrations, and the exposure and risk calculations are performed in a manner that is identical to the calculations presented in the RI Report. The uncertainties pertaining to the ERA remain the same as those identified in the RI Report.

The risk calculations for the deer mouse, robin, and red-tailed hawk are presented on Tables VI-2, VI-3, and VI-4, respectively. As seen on these tables, only one hazard quotient (HQ) exceeds a value of 1 using the maximum modeled concentrations, an HQ of 7 for zinc for the American robin. The HQ for zinc for the American robin using an average of all of the deposition modeling results in conjunction with worst-case exposure assumptions and toxicity values is 2.

C. Scientific Management Decision Point

Concerning potential ecological risks associated with the residue piles, based on the information, data and ecological risk information developed and presented in this addendum, it is concluded that the ecological risks to terrestrial receptors are minimal and, therefore, there is no need for any further action on the basis of ecological risk.

Concerning the hypothetical future scenario that was evaluated by CH2M Hill in their Memorandum, CH2M Hill concluded that unacceptable risks to ecological receptors may be associated with exposure to soil, sediment, and surface water if:

- The residue piles are regraded such that fine residues (i.e., <75 micron fraction) are dispersed over the entire surface of the site and in the drainageways;
- The exposure concentrations for all residues are equal to the concentrations in the single Composite Sample (sample containing <75 micron size fraction); and
- The constituent concentrations in the residue particles are 100% bioavailable to ecological receptors.

VII. CONCLUSIONS

As discussed in the RI Report, the HHRA conducted for the Eagle Zinc Company Site was predicated on the assumption that the residue piles are an important historical source and the only potential current source of COPCs at the site. At the request of USEPA, the screening-level modeling effort documented in this addendum was undertaken in an effort to determine whether transport of material from the piles and direct contact with the piles could, under worst-case assumptions, result in unacceptable human exposure and risk. The results of this analysis clearly support the conclusion that under current and reasonably anticipated future conditions, the residue piles do not pose unacceptable risks to human health.

The ecological risk assessment similarly supports the conclusion that, under current and reasonably anticipated conditions, the risks to ecological receptors are not unacceptable.

Based on the human health and ecological evaluations conducted and presented in the Technical Memorandum by CH2M Hill, unacceptable risks may be associated with commercial/industrial workers exposed to the material in some of the residue piles, and to ecological receptors if, among other assumptions, the site and drainageways are covered with only the <75 micron fraction from the residue piles.

VIII. REFERENCES

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TABLE II-1
Off-Site Soil Samples Collected by IEPA, 1993
Eagle Zinc Company Site
Hillsboro, Illinois

Date			1993	1993	1993	1993	1993	1993	1993
Sample			X101-B/G	X102-B/G	X104[a]	X106	X107	X108	X109
Parameter	USEPA Region III RBCs (Residential)	95% UCL[c]							
Aluminum (mg/kg)	78,000	13,604	12,400	10,000	6,880	13,000	13,000	11,500	**10,200**
Antimony (mg/kg)	31	12	8.9 J	9.2 J	10.6 J	9.4 J	10.5 J	13 J	**9.3** J
Arsenic (mg/kg)	0.43	9.81	**5.8**	**5.7**	**6.6**	**6.2**	**8.7**	**13.4**	**4.6**
Barium (mg/kg)	5,500	204	230	265	181	224	124	267	**130**
Beryllium (mg/kg)	160	1	0.8 B	0.81 B	0.49 B	0.63 B	0.72 B	1 B	**0.6** B
Cadmium (mg/kg)	78 (food)	4	--	--	3.2	0.89 B	3.5	11.3	**0.71** B
Calcium (mg/kg)	--	8,633	10,600	9,880	598 B	11,600	5,360	5,430	**2,580**
Chromium (mg/kg)	230 (VI)	19	16.2	14.4	10.3	15.1	16.1	23.4	**13.4**
Cobalt (mg/kg)	1,600	12	4.1 B	6.5 B	13.7	11.1	5.6 B	14.8	**6.9** B
Copper (mg/kg)	3,100	42	20 J	19.7 J	30.6 J	24.7 J	36.4 J	104	**15.3**
Iron (mg/kg)	23,000	22,007	14,700	14,400	11,500	15,400	14,900	**33,900**	**12,600**
Lead (mg/kg)	400	143	148	236	61	28.5	105	388	**47**
Magnesium (mg/kg)	--	2,527	2,370	2,090	1,040 B	2,150	2,090	1,630	**1,530**
Manganese (mg/kg)	1,600 (non-food)	1,149	434	686	1,180	922	600	**1,670**	**660**
Mercury (mg/kg)	23[b]	0	0.17	0.18	--	--	0.16	0.16	**0.11** B
Nickel (mg/kg)	1,600	21	13.5	11.5	20	14	15.9	35.1	**11**
Potassium (mg/kg)	--	1,923	1,890	1600	491 J	1,060 J	1160 J	--	**1,650**
Selenium (mg/kg)	39	1	--	1.3 J	0.27 J	--	--	0.84 J	**0.31** J
Silver (mg/kg)	390	2	--	--	--	--	--	--	--
Sodium (mg/kg)	--	256	106 B	87.9 B	47.5 B	37.4 B	71.8 B	178 B	**65.7** B
Thallium (mg/kg)	5.5	0.7	0.33 B	0.34 J	1.2 J	0.26 J	0.35 J	1.4 J	**0.28** J
Vanadium (mg/kg)	78	37	28.5	27.1	27.5	28.5	27.3	37.7	**24.7**
Zinc (mg/kg)	23,000	2,592	136	138	4,770	1,490	2,480	2,280	**360**

Date	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993
Sample	X110[a]	X111	X112	X113	X114	X115	X116	X117	X118	X119	X120
Parameter											
Aluminum (mg/kg)	15,000	13,500	9,950	16,600	9,750	14,800	12,500	13,800	1,410	9,390	16,300
Antimony (mg/kg)	**7.9** J	**9** J	**10.2** J	**7.8** J	**8.4** J	**11.1** J	**9.9** J	**14.5** J	**10.9** J	**8.3** J	**8** J
Arsenic (mg/kg)	13.6	8.5	6.2	5.6	11.9	10.5	7.1	8.5	5.9	6.7	10.7
Barium (mg/kg)	150	193	233	116	183	181	227	222	106	196	155
Beryllium (mg/kg)	0.78 B	0.94 B	0.85 B	0.85 B	1	0.8 B	0.93 B	1.7	0.73 B	0.6 B	0.95
Cadmium (mg/kg)	2	1.6	2.8	0.68 B	2.9	1.48	2.3	4.8	--	2.8	--
Calcium (mg/kg)	3,450	8,380	2,800	5,940	4,230	4,970	8,430	19,300	1,720	12,100	2,870
Chromium (mg/kg)	20.7	20.2	14.8	21.7	15.9	19.4	18.9	17.3	18.5	13.7	20.4
Cobalt (mg/kg)	8.5 B	7.8 B	11.3 B	10.6	5.8 B	7 B	9.8 B	10.6 B	11.1 B	14.9	7.4 B
Copper (mg/kg)	22.5	33.8	15.9	22.5	28.3 J	27.8 J	25.5 J	57.2 J	15.9 J	17.5 J	17.2 J
Iron (mg/kg)	20,700	19,300	13,900	20,400	**28,600**	19,700	18,900	21,100	18,200	14,100	22,900
Lead (mg/kg)	87.6	70.8	70.1	75.1	137	76.2	147	186	30.4	51.9	32.7
Magnesium (mg/kg)	2,500	1,950	17.6	4,870	1,130	2,030	2,020	2,140	2,120	1,790	2,870
Manganese (mg/kg)	563	491	**2,070**	568	314	538	851	995	795	1,520	889
Mercury (mg/kg)	--	0.11 B	0.11 B	--	--	0.42	0.24	0.14 B	--	0.32	--
Nickel (mg/kg)	15.9	16.5	22.9	18.6	14.4	10.9	16.5	27.5	12.8	14.8	16.9
Potassium (mg/kg)	1,980	1,920	1,970	2,400	1,040	1,470	1,750	1,460 J	1,210 J	1,670	1,490
Selenium (mg/kg)	0.49 J	0.42 J	0.39 J	0.27 J	0.76 J	0.52 J	0.53 J	0.35 J	0.27 J	0.55 J	0.38 J
Silver (mg/kg)	--	--	--	--	--	1.2	--	--	--	--	--
Sodium (mg/kg)	62.8 B	120 B	52.4 B	45.8	293 B	61.5 B	89.9 B	1,020 B	--	--	27.7 B
Thallium (mg/kg)	--	0.25 J	0.28 J	0.27 J	0.71 J	0.57 J	0.53 J	0.35 J	0.27 J	0.5 J	0.25 J
Vanadium (mg/kg)	38.7	34.2	28.2	33.7	29.7	34.8	35.1	34.3	34.5 B	26.7	39
Zinc (mg/kg)	606	488	489	451	1,580	638	998	7,420	354	1,570	371

Notes:
mg/kg = milligrams per kilogram.
B = The reported value is less than the CRDL but greater that the instrument detection limit.
J = Estimated value. Used in data validation when the quality control data indicate that a value may not be accurate.
-- = Not detected.
Concentrations exceeding RBCs are highlighted in **bold**.
[a] **While technically located on site Samples X104 and X110 were grouped with other 1993 off-site samples and hence had been compared to more stringent residential values. Source: 1993 CERCLA Expanded Site Inspection Report.**
[b] USEPA Region IX PRG.
[c] The background sample data were excluded from the 95% UCL calculations.

TABLE III-1
Soil Sampling Information, March 2005
Eagle Zinc Company Site
Hillsboro, Illinois

Soil Area	Sample Date	Soil Sample ID	Sample Depth (ft)	Lab Analyses
Area 1	3/16/05	A1-3-S1	0-0.5	TAL Metals
Area 1	3/16/05	A1-3-S1-2	0.5-1.0	TAL Metals
Area 1	3/16/05	A1-26-S1[a]	0-0.5	TAL Metals
Area 3	3/16/05	A2-3-S1	0-0.5	TAL Metals
Area 3	3/16/05	A2-3-S1D	0-0.5	TAL Metals
Area 3	3/16/05	A2-13-S1	0-0.5	TAL Metals
Northern Area	3/11/05	NA-S1	0-0.5	TAL Metals
Northern Area	3/11/05	NA-S2	0-0.5	TAL Metals
Northern Area	3/11/05	NA-S2D	0-0.5	TAL Metals
Northern Area	3/11/05	NA-S3[a]	0-0.5	TAL Metals
Northern Area	3/11/05	NA-S4	0-0.5	TAL Metals

Notes:
ft = feet
TAL = Target Analyte List
A2-3-S1D and NA-S2D collected as duplicate samples.
[a]Designated as matrix spike/matrix spike duplicate (MS/MSD).

TABLE III-2
Residue Pile Sampling Information, March 2005
Eagle Zinc Company Site
Hillsboro, Illinois

Lab Sample Number	Residue Type	Lab Analyses[b]
RR1-1	RR1	TAL Metals, Particle Size
RR1-2	RR1	TAL Metals, Particle Size
RR1-3	RR1	TAL Metals, Particle Size
RCO-5	RCO	TAL Metals, Particle Size
CPH-6	CPH	TAL Metals, Particle Size
CPH-9	CPH	TAL Metals, Particle Size
RCO-10	RCO	TAL Metals, Particle Size
RR2-11[a]	RR2	TAL Metals, Particle Size
RRO-12	RRO	TAL Metals, Particle Size
RRO-12D	RRO	TAL Metals, Particle Size
RR1-4	RR1	TAL Metals, Particle Size
NP-13	unk	TAL Metals, Particle Size
NP-14	unk	TAL Metals, Particle Size
NP-15	MP	TAL Metals, Particle Size
NP-16	RRO	TAL Metals, Particle Size
Composite Sample	All[c]	TAL Metals
MP-21	MP	TAL Metals, Particle Size

Notes:
RR1 = Rotary Residue Type 1
RR2 = Rotary Residue Type 2
RCO = Rotary clean ou
RRO = Rotary Residue Oversized
CPH = Carbon Plant Hutch
MP = Miscellaneous Piles
unk = Unknown pile type
RRO-12D = collected as a duplicate sample
[a]Designated as matrix spike/matrix spike duplicate (MD/MSD).
[b]TAL metal samples collected from the surface of each pile/pile group as a 6-point composite. Particle size samples collected from the surface of each pile/pile group at a single representative location.
[c]Composite of the size fraction from each of the 15 residue samples that passed through a #200 sieve (< 75 microns).

Table III-3
Residue Pile Sampling Analytical Results, March 2005
Eagle Zinc Company Site
Hillsboro, Illinois

Sample ID	COMPOSITE SAMPLE	CPH-6	CPH-9	MP1-21	NP-13	NP-14	NP-15	NP-16	RCO-10	RCO-5	RRO-12D	RRO-12	RR1-1	RR1-2	RR1-3	RR1-4	RR2-11
Parameter (mg/kg)																	
Aluminum	12,000	7,000 J	3,800 J	5,700	8,300 J	3,900 J	9,600 J	6,000 J	20,000 J	8,300 J	11,000	7,700 J	5,300	7,300	4,500 J	6,000 J	35,000 J
Antimony	R	8.3	16 U	190 J	17 U	16 U	110	3.8 J	190	6.5	17 UJ	41	16 UJ	16 UJ	16 U	16 U	400
Arsenic	55	33 J	8.1 J	200	5.7 J	3.1 J	11 J	12 J	41 J	19 J	15	11 J	9.1	6.8	16 J	7.9 J	21 J
Barium	220	210	150	870	290	210	110	130	350	230	420	170	160	130	480	150	130
Beryllium	1.1 J	1.3	0.68	0.84	1.2	0.66	0.97	0.86	2.4	2.9	2	1.6	1.1	0.79	0.86	0.89	1.5
Cadmium	22	10 U	6.1 U	50	23 U	32 U	19 U	15 U	24 U	21 U	10	6.9 U	5.6	9.4	35 U	4.9 U	7.2 U
Calcium	5,600	9,900 J	7,500 J	2,100	5,000 J	1,900 J	8,200 J	16,000 J	20,000 J	17,000 J	19,000	17,000 J	6,200	3,500	950 J	9,400 J	3,300 J
Chromium	50	10	4.4	22 J	11	4.9	62	22	220	30	38 J	47	8.6 J	9.2 J	12	6.8	290
Cobalt	630	250	440	110	8.2	4.4	500	430	760	570	560	440	140	70	9.7	880	93
Copper	3,700	2,400 J	2,100 J	3,600	190 J	140 J	1,900 J	1,900 J	24,000 J	2,200 J	3,400	2,200 J	3,400	2,000	400 J	2,600 J	34,000 J
Iron	82,000	110,000	47,000	110,000	24,000	5,500	31,000	36,000	60,000	25,000	73,000	48,000	75,000	60,000	88,000	72,000	77,000
Lead	7,100	800	79	31,000	76	74	1,200	550	2,500	530	520	810	450	250	1,600	120	7,700
Magnesium	3,200	4,200 J	4,400 J	1,000 J	700 J	570 J	3,000 J	3,800 J	5,400 J	3,800 J	5,200 J	4,700 J	3,400 J	1,400 J	340 J	6,000 J	1,200 J
Manganese	2,500	910	330	8,300 J	490	65	510	1,100	880	570	1,300 J	930	330 J	190 J	160	290	750
Mercury	0.43	0.43	0.046	0.065	0.028	0.036	0.10	0.23	0.024	0.056	0.047	0.090	0.053	0.038	0.075	0.038	0.012
Nickel	1,600	650	610	59	21	10	1,300	800	7,000	1,100	1,100	1,000	790	610	22	890	10,000
Potassium	660	1,300 J	770 J	140 J	600 J	240 J	410 J	640 J	1,400 J	470 J	1,300 J	700 J	770 J	490 J	340 J	630 J	230 J
Selenium	15 U	6.9 J	4.4 J	4.7	1.8 J	2.8 J	8.1 J	5.7 J	4.8 J	5.8 J	5.5	4.0 J	5.7	4.7	1.7 J	3.5 J	3.6 J
Silver	58	14	48	140	0.39	0.48	9.5	21	43	13	34	18	8.9	3.9	1.8	77	29
Sodium	1,600	340 J	450 J	51	460 J	220 J	170 J	1,100 J	810 J	730 J	1,700	1,100 J	230	200	130 J	340 J	250 J
Thallium	8.4	0.31 UJ	0.32 UJ	0.11 J	0.24 J	0.070 J	0.12 J	0.11 J	0.085 J	0.098 J	0.05 J	0.11 J	0.32 U	0.053 J	0.098 J	0.32 UJ	1.0 J
Vanadium	34	11	12	21	29	12	9.8	18	14	15	20	17	12	12	27	10	5.7
Zinc	180,000	190,000	170,000	39,000	25,000	39,000	180,000	150,000	130,000	200,000	150,000	120,000	210,000	190,000	7,700	130,000	140,000

Notes:
mg/kg = milligrams per kilogram
U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limits
J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the samples
R = The data are unusable. The sample result are rejected to serious deficiencies in meeting Quality Control criteria. The analyte may or may not be present in the sample
UJ = The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise

Table III-4
Surface Soil Analytical Results, March 2005
Eagle Zinc Company Site
Hillsboro, Illinois

Parameter (mg/kg)	USEPA Region III RBCs for Residential Soil	Illinois Background	Sample ID: A1-26-S1 Depth: 0-6"	A1-3-S1 0-6"	A1-3-S1-2 6-12"	A2-13-S1 0-6"	A2-3-S1 0-6"	A2-3-S1D 0-6"	NA-S1 0-6"	NA-S2 0-6"	NA-S2D 0-6"	NA-S3 0-6"	NA-S4 0-6"
Aluminum	78000	9200	19,000 J	18,000 J	21,000 J	9,800 J	11,000 J	11,000 J	11,000	8,400	8,600	11,000	7,600
Antimony	31	3.3	18 UJ	5.4 J	1.8 UJ	18 UJ	19 UJ	18 UJ	19 UJ	19 UJ	21 UJ	19 UJ	20 UJ
Arsenic	0.43	11.3	12	21	4.5	2.3	11	7.4	7.3	4	4.8	3.7	3
Barium	5500	122	190	150	110	150	160	150	160	120	93	150	84
Beryllium	160	0.56	0.8	0.71	1.0	0.65	0.78	0.65	0.56	0.46	0.58	0.53	0.38
Cadmium	78	0.5	7.3 J	7.8 J	4.7 J	5.8 J	7.7 J	7.3 J	2.5	5.9	7.7	2.7	1.5
Calcium	1000000	5525	1,000	1,000	1,600	1,800	650	670	8,500	1,100	1,500	2,300	1,700
Chromium	230	---	21 J	22 J	23	13 J	15 J	15 J	14 J	11 J	13 J	13 J	9.7 J
Cobalt	1600	8.9	13	12	6.0	3.3	18	8	8.3	4.2	6.6	3.7	2.9
Copper	3100	12	130 J	180 J	12 J	27 J	7.7 J	12 J	20	67	170	19	10
Iron	23000	15000	27,000	25,000	19,000	8,100	16,000	12,000	14,000	9,000	10,000	11,000	7,300
Lead	400	20.9	500	1,100	24	26	30	29	87	120	230	40	31
Magnesium	420000	2700	2,200 J	2,700 J	2,500 J	990 J	1,400 J	1,400 J	1,300 J	1,000 J	1,100 J	1,200 J	920 J
Manganese	1600	630	540	490	190	160	960	400	1,000 J	260 J	320 J	260 J	280 J
Mercury	23	---	0.042	0.028	0.041	0.034	0.02	0.023	0.02	0.031	0.05	0.019	0.015
Nickel	1600	---	42 J	18 J	16 J	8.0 J	11 J	9.2 J	11	11	37	9.6	6.6
Potassium	1000000	---	1,300 J	1,400 J	670 J	840 J	900 J	940 J	910 J	730 J	750 J	870 J	810 J
Selenium	390	---	0.99 J	1.1 J	0.64 J	0.81 J	1.2	0.88 J	0.89 J	0.88 J	1.1 J	0.59 J	0.62 J
Silver	390	---	0.97	3.4	0.054 J	0.10	0.056 J	0.05 J	0.26	0.22	0.38	0.11	0.1 J
Sodium	1000000	---	53	41	73	98	70	66	36	47	58	37	33
Thallium	6.3	---	0.35	0.31	0.17 J	0.19 J	0.35	0.37	0.2	0.17	0.17 J	0.16	0.13 J
Vanadium	23	---	39	42	33	23	40	33	32	21	22	28	19
Zinc	23000	---	4,800 J	2,700 J	93 J	770 J	460 J	710 J	1,600	5,100	7,700	1,500	950

Notes:

mg/kg = milligrams per kilograms

RBCs = Risk-Based Concentrations

U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limits

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the samples

R = The data are unusable. *The sample result are rejected to serious deficiencies in meeting Quality Control criteria. The analyte may or may not be present in the sample*

UJ = The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise

TABLE IV-1
Dispersion Model Results: 10 Micron, One-Hour Concentration Results
Eagle Zinc Company Site
Hillsboro, Illinois

Pile ID	Maximum Concentration ($\mu g/m^3$)	Distance to Maximum Concentration (m)[b]
CPH-6	0.07662	90
CPH-9	0.07988	51
MP1-21	Not Modeled[a]	NA
NP-13	Not Modeled[a]	NA
NP-14	Not Modeled[a]	NA
NP-15	0.25070	74
NP-16	0.08302	73
RCO-10	0.12110	58
RCO-5	Not Modeled[a]	NA
RR1-1	Not Modeled[a]	NA
RR1-2	Not Modeled[a]	NA
RR1-3	1.31300	47
RR1-4	Not Modeled[a]	NA
RR2-11	0.20130	88
RRO-12	0.73220	95

Notes:
$\mu g/m^3$ = micrograms per cubic meter
m = meter
NA = Not Analyzed
[a] The calculated friction velocity was less than or equal to the threshold friction velocity. Therefore, no emissions due to wind erosion occur.
[b] None of the distances from the pile/pile group to the maximum concentration extend off-Site.

TABLE IV-2
Dispersion Model Results: 30 Micron, One-Hour Concentration Results
Eagle Zinc Company Site
Hillsboro, Illinois

Pile ID	Maximum Concentration ($\mu g/m^3$)	Distance to Maximum Concentration (m)
CPH-6	0.1530	90
CPH-9	0.1595	51
MP1-21	Not Modeled[a]	NA
NP-13	Not Modeled[a]	NA
NP-14	Not Modeled[a]	NA
NP-15	0.5006	74
NP-16	0.1658	73
RCO-10	0.2417	58
RCO-5	Not Modeled[a]	NA
RR1-1	Not Modeled[a]	NA
RR1-2	Not Modeled[a]	NA
RR1-3	2.6360	47
RR1-4	Not Modeled[a]	NA
RR2-11	0.4039	88
RRO-12	1.4690	95

Notes:
$\mu g/m^3$ = micrograms per cubic meter
m = meter
NA = Not Analyzed
[a] The calculated friction velocity was less than or equal to the threshold friction velocity. Therefore, no emissions due to wind erosion occur.

TABLE IV-3
Parameter Input Values for Deposition Calculations
Eagle Zinc Company Site
Hillsboro, Illinois

Parameter	Description	Value	Units	Source
T_1	Time period at the beginning of deposition	0	yr	Assumed
tD	time period over which deposition occurs	30	yr	Assumed
T_2	Length of exposure duration	70	yr	Assumed
P	Annual Average Precipitation	92.5	cm/yr	Figure 4, Baes and Sharp, 1983
I	Average annual irrigation	3	cm/yr	Figure 5, Baes and Sharp, 1983
E_v	average annual evapotranspiration	67.5	cm/yr	Figure 6, Baes and Sharp, 1983
CN	Curve number	61	-	Table 3.9, Novotny, 1994
θ_{sw}	Soil volumetric water content	0.2	ml/cm^3	Chapter 5, EPA, 1998
Z_s	Soil Mixing depth	15.24	cm	EPA letter dated Feburary 21, 2005
BD	Soil Bulk Density	1.5	g $soil/cm^3$ soil	Chapter 5, EPA, 1998
g	gravitional acceleration	9.8	m^2/s	
υ	kinematic ciscosity of air at 25°C	1.51×10^{-5}	m^2/s	Clark, 1996
ρ_p	density of the particle	1939	kg/m^3	Bulk Density data collected pre-RI
ρ_f	density of the air at 25°C	1.184	kg/m^3	Clark, 1996
d_p	Diameter of the particle	30	µm	EPA letter dated Feburary 21, 2005

Table IV-4
Partition Coefficients (Kd_s)
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte	Pile															Source
	RR1-3	RR2-11	RCO-10	RR1-4	CPH-6	CPH-9	RCO-5	MP1-21	RR1-1	RR1-2	RRO-12	NP-13	NP-14	NP-15	NP-16	
Aluminum	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	Average
Antimony	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	EPA, 1998
Arsenic	2,133	2,800	5,467	1,053	4,400	1,080	2,533	26,667	1,213	907	1,467	760	413	1,467	1,600	Calculated from SPLP and TAL data
Barium	5,393	1,000	2,917	6,250	3,684	1,923	3,382	14,746	1,455	1,667	2,698	15,263	6,000	1,594	2,031	Calculated from SPLP and TAL data
Beryllium	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	EPA, 1998
Cadmium	778	4,800	533	3,267	222	4,067	14,000	658	1,600	2,186	4,600	15,333	1,882	12,667	10,000	Calculated from SPLP and TAL data
Calcium	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	Baes and Sharp, 1983
Chromium	8,000	193,333	146,667	4,533	6,667	2,933	20,000	14,667	5,733	6,133	31,333	7,333	3,267	41,333	14,667	Calculated from SPLP and TAL data
Cobalt	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	EPA, 1999
Copper	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	EPA, 1999
Iron	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	Baes and Sharp, 1983
Lead	320,000	1,540,000	500,000	24,000	160,000	15,800	106,000	50,000	90,000	50,000	162,000	15,200	14,800	240,000	110,000	Calculated from SPLP and TAL data
Magnesium	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	Baes and Sharp, 1983
Manganese	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	Baes and Sharp, 1983
Mercury	750	120	240	380	4,300	460	560	650	530	380	900	280	360	1,000	2,300	Calculated from SPLP and TAL data
Nickel	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	EPA, 1998
Potassium	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	Baes and Sharp, 1983
Selenium	227	480	640	467	920	587	773	733	760	627	533	240	373	1,080	760	Calculated from SPLP and TAL data
Silver	720	11,600	17,200	30,800	5,600	19,200	5,200	56,000	3,560	1,560	7,200	156	192	3,800	8,400	Calculated from SPLP and TAL data
Sodium	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	Average
Thallium	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	EPA, 1998
Vanadium	501	501	501	501	501	501	501	501	501	501	501	501	501	501	501	EPA, 1999
Zinc	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	EPA, 1998

Table IV-5
Modeled Soil Concentrations - Noncarcinogens
Eagle Zinc Company Site
Hillsboro, Illinois

Analytes	Pile ID Maximum	RR1-3	RR2-11	RCO-10	RR1-4	CPH-6	CPH-9	RCO-5	MP1-21	RR1-1	RR1-2	RRO-12	NP-13	NP-14	NP-15	NP-16
Aluminum	3.1	2.6	3.1	1.1	NA	0.2	0.1	NA	NA	NA	NA	2.5	NA	NA	1.1	0.2
Antimony	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Arsenic	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Barium	0.3	0.3	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.1	NA	NA	0.0	0.0
Beryllium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Cadmium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Calcium	1.4	0.1	0.1	0.3	NA	0.1	0.1	NA	NA	NA	NA	1.4	NA	NA	0.2	0.2
Chromium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Cobalt	0.1	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.1	NA	NA	0.1	0.0
Copper	3.0	0.2	3.0	1.3	NA	0.1	0.1	NA	NA	NA	NA	0.7	NA	NA	0.2	0.1
Iron	50.0	50.0	6.7	3.1	NA	3.6	1.6	NA	NA	NA	NA	15.2	NA	NA	3.3	1.3
Lead	0.9	0.9	0.7	0.1	NA	0.0	0.0	NA	NA	NA	NA	0.3	NA	NA	0.1	0.0
Magnesium	0.5	0.1	0.0	0.1	NA	0.0	0.1	NA	NA	NA	NA	0.5	NA	NA	0.1	0.0
Manganese	0.3	0.1	0.1	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.3	NA	NA	0.1	0.0
Mercury	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Nickel	0.9	0.0	0.9	0.4	NA	0.0	0.0	NA	NA	NA	NA	0.3	NA	NA	0.1	0.0
Potassium	0.1	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.1	NA	NA	0.0	0.0
Selenium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Silver	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Sodium	0.4	0.1	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.4	NA	NA	0.0	0.0
Thallium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Vanadium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Zinc	29.2	3.4	9.4	5.2	NA	4.8	4.5	NA	NA	NA	NA	29.2	NA	NA	14.9	4.1

Notes:
All soil concentrations in milligrams per kilogram (mg/kg).
NA = Not Analyzed.

Table IV-6
Modeled Soil Concentrations - Carcinogens
Eagle Zinc Company Site
Hillsboro, Illinois

Analytes	Pile ID Maximum	RR1-3	RR2-11	RCO-10	RR1-4	CPH-6	CPH-9	RCO-5	MP1-21	RR1-1	RR1-2	RRO-12	NP-13	NP-14	NP-15	NP-16
Aluminum	2.4	2.0	2.4	0.8	NA	0.2	0.1	NA	NA	NA	NA	1.9	NA	NA	0.8	0.2
Antimony	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Arsenic	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Barium	0.2	0.2	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Beryllium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Cadmium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Calcium	0.6	0.1	0.0	0.1	NA	0.0	0.0	NA	NA	NA	NA	0.6	NA	NA	0.1	0.1
Chromium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Cobalt	0.1	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.1	NA	NA	0.0	0.0
Copper	2.3	0.2	2.3	1.0	NA	0.1	0.1	NA	NA	NA	NA	0.6	NA	NA	0.2	0.1
Iron	38.6	38.6	5.2	2.4	NA	2.8	1.2	NA	NA	NA	NA	11.7	NA	NA	2.6	1.0
Lead	0.7	0.7	0.5	0.1	NA	0.0	0.0	NA	NA	NA	NA	0.2	NA	NA	0.1	0.0
Magnesium	0.2	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.2	NA	NA	0.1	0.0
Manganese	0.2	0.1	0.1	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.2	NA	NA	0.0	0.0
Mercury	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Nickel	0.7	0.0	0.7	0.3	NA	0.0	0.0	NA	NA	NA	NA	0.2	NA	NA	0.1	0.0
Potassium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Selenium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Silver	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Sodium	0.3	0.1	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.3	NA	NA	0.0	0.0
Thallium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Vanadium	0.0	0.0	0.0	0.0	NA	0.0	0.0	NA	NA	NA	NA	0.0	NA	NA	0.0	0.0
Zinc	18.4	2.1	5.9	3.3	NA	3.0	2.8	NA	NA	NA	NA	18.4	NA	NA	9.4	2.6

Notes:
All soil concentrations in milligrams per kilogram (mg/kg).
NA = Not Analyzed.

TABLE V-1
Summary of Potential Exposure Pathways Considered in the HHRA Addendum
Eagle Zinc Company Site
Hillsboro, Illinois

Potential Exposure Medium	Potential Exposure Route	Data Used to Evaluate	Method of Evaluation
Residues	Ingestion Dermal Contact	Residue analytical data <75 micron residue composite sample	Metals concentration data from piles compared with USEPA Region III commercial/industrial RBCs
Respirable emissions from residue pile	Particle inhalation	Emission/ dispersion modeling, residue analytical data	Metals concentration data from piles compared with pile-specific residue screening levels back-calculated based on USEPA inhalation toxicity criteria, modeled respirable dust concentration, and residential exposure assumptions
Surface soil (residue pile emission deposition modeling)	Particle inhalation Ingestion Dermal contact	Emission/ dispersion/ deposition modeling, residue analytical data	Maximum modeled or measured metals concentrations in soil screened against COPC screening levels (USEPA Region III residential RBCs and Illinois regional background levels), as in the HHRA (see Section II.B of the RI Report). Results exceeding these COPC screening levels compared to Tier 1 risk-based screening levels for soil developed in the HHRA for on-Site receptors: Commercial/Industrial Workers, Construction Workers, and Trespassers.
Surface soil	Particle inhalation Ingestion Dermal contact	Soil data collected March 2005	Maximum modeled or measured metals concentrations in soil screened against COPC screening levels (USEPA Region III residential RBCs and Illinois regional background levels), as in the HHRA (see Section II.B of the RI Report). Results exceeding these COPC screening levels compared to Tier 1 risk-based screening levels for soil developed in the HHRA for on-Site receptors: Commercial/Industrial Workers, Construction Workers, and Trespassers.

Notes:

COPC = Constituent of Potential Concern
RBC = Risk Based Concentrations
HHRA = Human Health Risk Assessment

TABLE V-2
Comparison of Maximum Modeled Soil Concentrations with COPC Screening Levels
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte	USEPA Region III Residential Soil RBC [a] (mg/kg)	Illinois Background [b] (mg/kg)	Maximum Modeled Concentration (mg/kg)
Aluminum	78,000	9,200	3.1
Antimony	31	3.3	0.024
Arsenic	0.43	11.3	0.0092
Barium	16,000	122	0.28
Beryllium	160	0.56	0.00052
Cadmium	78	0.5	0.0097
Chromium	230	--	0.026
Cobalt	1,600	8.9	0.14
Copper	3,100	12	3
Iron	23,000	15,000	50
Lead [c]	400	20.9	0.93
Manganese	1,600	630	0.30
Mercury	23	--	0.000042
Nickel	1,600	--	0.880
Selenium	390	--	0.0013
Silver	390	--	0.0058
Thallium	5.5	--	0.000074
Vanadium	78	--	0.015
Zinc	23,000	--	29

Notes:
--: No Illinois background value
mg/kg = milligrams per kilogram
[a]Data obtained from http:www.epa.gov/reg3hwmd/risk/human/index.htm.
[b]As specified in Table G of Appendix A of 35 Illinois Administrative Code 742.
[c]Value for lead obtained from USEPA (2002).

TABLE V-3
Comparison of Maximum Detected Concentrations in March 2005 Soil Samples with Screening Levels
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte	USEPA Region III Residential Soil RBC [a] (mg/kg)	Illinois Background [b] (mg/kg)	Maximum Measured Concentration (mg/kg)
Aluminum	78,000	9,200	21,000
Antimony	31	3.3	21
Arsenic	0.43	11.3	***21***
Barium	16,000	122	190
Beryllium	160	0.56	1
Cadmium	78	0.5	7.8
Chromium	230	--	23
Cobalt	1,600	8.9	18
Copper	3,100	12	180
Iron	23,000	15,000	***27,000***
Lead [c]	400	20.9	***1,100***
Magnesium	420,000	2,700	2,700
Manganese	1,600	630	1,000
Mercury	23	--	0.05
Nickel	1,600	--	42
Selenium	390	--	1.20
Silver	390	--	3.4
Thallium	6.30	--	0.37
Vanadium	23	--	***42***
Zinc	23,000	--	7,700

Notes:

--: No Illinois background value

mg/kg = milligrams per kilogram

Designates exceedance of COPC screening level.

[a]Data obtained from http:www.epa.gov/reg3hwmd/risk/human/index.htm.

[b]As specified in Table G of Appendix A of 35 Illinois Administrative Code 742.

[c]Value for lead obtained from USEPA (2002b).

TABLE V-4

Exposure Parameter Values Used to Calculate Residue Pile Screening Levels[a]
Eagle Zinc Company Site
Hillsboro, Illinois

Parameter	Value	Units	Description
RSL_{Inh}		mg/kg	Residue Screening Level for inhalation of respirable particles originating from the pile
AT_c	25,550	days	Default lifetime
AT_{nc}	= ED x 365	days	
URF		$(mg/m^3)^{-1}$	Inhalation unit risk factor [chemical-specific; see Table V-3]
RfC		mg/m^3	Inhalation reference concentration [chemical-specific; see Table V-3]
EF	350	days/yr	Default residential exposure frequency
ED	30	yrs	Default residential exposure duration
PEF_{RP}		m^3/kg	Residue pile-specific particulate emission factor
THQ	1	unitless	Target hazard quotient
TR	10^{-6}	unitless	Target cancer risk level

Notes:

[a]Except as indicated, all values are defaults taken from USEPA (2002).

TABLE V-5

Inhalation Toxicity Criteria Used to Calculate Residue Pile Screening Levels[a]
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte	RfC (mg/m^3)	URF (m^3/mg)
Aluminum	0.005	No URF
Antimony [b]	0.0002	No URF
Arsenic	No RfC	4.3
Barium	0.0005	No URF
Beryllium	No RfC	2.4
Cadmium	No RfC	1.8
Chromium [c]	0.0001	12
Cobalt	0.00002	2.8
Copper	No RfC	No URF
Iron	No RfC	No URF
Lead	No RfC	No URF
Manganese	0.00005	No URF
Mercury	0.0003	No URF
Nickel [d]	No RfC	0.24
Selenium	No RfC	No URF
Silver	No RfC	No URF
Thallium	No RfC	No URF
Vanadium	No RfC	No URF
Zinc	No RfC	No URF

Notes:
RfC = Reference Concentration
URF = Unit Risk Factor
mg/m^3 = milligrams per cubic meter
m^3/mg = cubic meter per milligram
[a]From IRIS (USEPA 2005).
[b]Antimony as antimony trioxide.
[c]Chromium as hexavalent chromium.
[d]Nickel as nickel refinery dust.

TABLE V-6
Residue Pile-Specific PEFs and Screening Levels
Eagle Zinc Company Site
Hillsboro, Illinois

Residue Pile:	RR2-11		RCO-10		RR1-3		CPH-9		CPH-6		RRO-12		NP-15		NP-16	
PEF_{RP} (m^3/kg):	4.97E+09		8.26E+09		7.62E+08		1.25E+10		1.31E+10		1.37E+09		3.99E+09		1.20E+10	
Analyte	SSL (NC)	SSL (C)	SSL (NC)	SSL (C)	SSL (NC)	SSL (C)	SSL (NC)	SSL (C)	SSL (NC)	SSL (C)	SSL (NC)	SSL (C)	SSL (NC)	SSL (C)	SSL (NC)	SSL (C)
Aluminum	*25,900,000*	---	*43,100,000*	---	*3,970,000*	---	*65,300,000*	---	*68,400,000*	---	*7,120,000*	---	*20,800,000*	---	*62,800,000*	---
Antimony[a]	*1,040,000*	---	*1,720,000*	---	159,000	---	*2,610,000*	---	*2,740,000*	---	285,000	---	832,000	---	*2,510,000*	---
Arsenic	---	2,810	---	4,670	---	431	---	7,080	---	7,420		773	---	2,260	---	6,820
Barium	*2,590,000*	---	*4,310,000*	---	397,000	---	*6,530,000*	---	*6,840,000*	---	712,000	---	*2,080,000*	---	*6,280,000*	---
Beryllium	---	5,040	---	8,370	---	772	---	12,700	---	13,300	---	1,380	---	4,040	---	12,200
Cadmium	---	6,720	---	11,200	---	1,030	---	16,900	---	17,700	---	1,850	---	5,390	---	16,300
Chromium[b]	518,000	1,010	861,000	1,670	79,400	154	*1,310,000*	2,540	*1,370,000*	2,660	142,000	277	416,000	809	*1,260,000*	2,440
Cobalt	104,000	4,320	172,000	7,180	15,900	662	261,000	10,900	274,000	11,400	28,500	1,190	83,200	3,470	251,000	10,500
Copper	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Iron	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Lead	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Manganese	259,000	---	431,000	---	39,700	---	653,000	---	684,000	---	71,200	---	208,000	---	628,000	---
Mercury	*1,550,000*	---	*2,580,000*	---	238,000	---	*3,920,000*	---	*4,100,000*	---	427,000	---	*1,250,000*	---	*3,770,000*	---
Nickel[c]	---	50,400	---	83,700	---	7,720	---	127,000	---	133,000	---	13,800	---	40,400	---	122,000
Selenium	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Silver	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Thallium	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Vanadium	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Zinc	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Notes:

--- = No SSL

m^3/kg = cubic meters per kilogram

PEF_{RP} = Residue Pile Particulate Emission Factor

SSL (NC) = Soil Screening Level (Non-Carcinogenic)

SSL (C) = Soil Screening Level (Carcinogenic)

All SSLs have units of milligrams per kilogram (mg/kg).

Underlined-italicized RSLs are greater than the maximum value of 1,000,000 mg/kg.

[a]Antimony as antimony trioxide.

[b]Chromium as hexavalent chromium.

[c]Nickel as nickel refinery dust.

TABLE V-7
Commercial/Industrial Worker Scenario: Comparison of Minimum Tier 1 Screening Levels with March 2005 Soil Data
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte	Tier 1 Screening Level (mg/kg) [a]		Concentration in Soil Sample (mg/kg) [b]										
	Ingestion/ Dermal Contact	Particle Inhalation	A1-26-S1	A1-3-S1	A1-3-S1-2	A2-13-S1	A2-3-S1	A2-3-S1D	NA-S1	NA-S2	NA-S2D	NA-S3	NA-S4
Arsenic	1.8	640	***12***	***21***	***5***	***2***	***11***	***7***	***7***	***4***	***5***	***4***	***3***
Iron	34,000	--	27,000	25,000	19,000	8,100	16,000	12,000	14,000	9,000	10,000	11,000	7,300
Lead [c]	1,288	--	500	1,100	24	26	30	29	87	120	230	40	31
Vanadium	2,200	--	39	42	33	23	40	33	32	21	22	28	19

Notes:
--: No Tier 1 Screening Level
mg/kg = milligrams per kilogram
Bold Italics *designates exceedance of screening level.*
[a] Screening levels except for lead are from the Eagle Zinc HHRA (RI Report Table VI-17).
[b] From Table III-4.
[c] From USEPA (2002b).

TABLE V-8
Construction Worker Scenario: Comparison of Minimum Tier 1 Screening Levels with March 2005 Soil Data
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte	Tier 1 Screening Level (mg/kg) [a]		Concentration in Soil Sample (mg/kg) [b]										
	Ingestion/ Dermal Contact	Particle Inhalation	A1-26-S1	A1-3-S1	A1-3-S1-2	A2-13-S1	A2-3-S1	A2-3-S1D	NA-S1	NA-S2	NA-S2D	NA-S3	NA-S4
Arsenic	110	16,000	12	21	5	2	11	7	7	4	5	4	3
Iron	89,000	--	27,000	25,000	19,000	8,100	16,000	12,000	14,000	9,000	10,000	11,000	7,300
Lead [c]	1.288	--	500	1,100	24	26	30	29	87	120	230	40	31
Vanadium	970	--	39	42	33	23	40	33	32	21	22	28	19

Notes:

--: No Tier 1 Screening Level

mg/kg = milligrams per kilogram

[a] Screening levels except for lead are from the Eagle Zinc HHRA (RI Report Table VI-18).

[b] From Table III-4.

[c] From USEPA (2002b).

TABLE V-9

Trespasser Scenario: Comparison of Minimum Tier 1 Screening Levels with March 2005 Soil Data
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte	Tier 1 Screening Level (mg/kg) [a]		Concentration in Soil Sample (mg/kg) [b]										
	Ingestion/ Dermal Contact	Particle Inhalation	A1-26-S1	A1-3-S1	A1-3-S1-2	A2-13-S1	A2-3-S1	A2-3-S1D	NA-S1	NA-S2	NA-S2D	NA-S3	NA-S4
Arsenic	240	50,000	12	21	5	2	11	7	7	4	5	4	3
Iron	1,000,000	--	27,000	25,000	19,000	8,100	16,000	12,000	14,000	9,000	10,000	11,000	7,300
Lead [c]	1,288	--	500	1,100	24	26	30	29	87	120	230	40	31
Vanadium	10,000	--	39	42	33	23	40	33	32	21	22	28	[illegible]9

Notes:

--: *No Tier 1 Screeening Level*

mg/kg = milligrams per kilogram

[a] Screening levels except for lead are from the Eagle Zinc HHRA (RI Report Table VI-19).

[b] From Table III-4.

[c] From USEPA (2002b).

TABLE V-10

Comparison of Air Pathway Residue Pile Screening Levels[a] with Residue Pile Metals Concentrations [b]

Eagle Zinc Company Site

Hillsboro, Illinois

Analyte (mg/kg)	CPH-6		CPH-9		NP-15		NP-16		RCO-10		RRO-12		RR1-3		RR2-11	
	Conc	RSL	Conc	RSL	Conc	RSL	Conc	RSL	Conc	RSL	Conc	RSL	Conc	RSL	Conc	RSL
Aluminum	7,000	68,400,000	3,800	65,300,000	9,600	20,800,000	6,000	62,800,000	20,000	43,100,000	7,700	7,120,000	4,500	3,970,000	35,000	25,900,000
Antimony	16	2,740,000	16	2,610,000	110	832,000	3.8	2,510,000	190	1,720,000	41	285,000	16	159,000	400	1,040,000
Arsenic	33	7,420	8.1	7,080	11	2,260	12	6,820	41	4,670	11	773	16	431	21	2,810
Barium	210	6,840,000	150	6,530,000	110	2,080,000	130	6,280,000	350	4,310,000	170	712,000	480	397,000	130	2,590,000
Beryllium	1.3	13,300	0.68	12,700	0.97	4,040	0.86	12,200	2.4	8,370	1.6	1,380	0.86	772	1.5	5,040
Cadmium	10	17,700	6.1	16,900	19	5,390	15	16,300	24	11,200	6.9	1,850	35	1,030	7.2	6,720
Chromium	10	2,660	4.4	2,540	62	809	22	2,440	220	1,670	47	277	12	154	290	1,010
Cobalt	250	11,400	440	10,900	500	3,470	430	10,500	760	7,180	440	1,190	9.7	662	93	4,320
Manganese	910	684,000	330	653,000	510	208,000	1,100	628,000	880	431,000	930	71,200	160	39,700	750	259,000
Mercury	0.43	4,100,000	0.046	3,920,000	0.1	1,250,000	0.23	3,770,000	0.024	2,580,000	0.09	427,000	0.075	238,000	0.012	1,550,000
Nickel	650	133,000	610	127,000	1,300	40,400	800	122,000	7,000	83,700	1,000	13,800	22	7,720	10,000	50,400

Notes:
mg/kg = milligrams per kilogram
RSL = Residue Pile Screening Level
[a] From Table V-4.
[b] From Table III-3.

TABLE V-11
Residue Pile Results Comp with Criteria
Eagle Zinc Company Site
Hillsboro, Illinois

Parameter (mg/kg)	Illinois Background Concentration[1]	USEPA Region 3 RBCs[2]	Sample: COMPOSITE SAMPLE (<75 Micron Fraction)	CPH-6	CPH-9	MP1-21	NP-13	NP-14	NP-15	NP-16	RCO-10	RCO-5	RRO-12D	RRO-12	RR1-1	RR1-2	RR1-3	RR1-4	RR2-11
Aluminum	9,200	1,000,000	12,000	7,000 J	3,800 J	5,700	8,300 J	3,900 J	9,600 J	6,000 J	20,000 J	8,300 J	11,000	7,700 J	5,300	7,300	4,500 J	6,000 J	35,000 J
Antimony	3.3	410	R	8.3	16 U	190 J	17 U	16 U	110	3.8 J	190	6.5	17 UJ	41	16 UJ	16 UJ	16 U	16 U	400
Arsenic	11.3	1.9	**55**	**33** J	8.1 J	**200**	5.7 J	3.1 J	11 J	**12** J	**41** J	**19** J	**15**	11 J	9.1	6.8	**16** J	7.9 J	**21** J
Barium	122	200,000	220	210	150	870	290	210	110	130	350	230	420	170	160	130	480	150	130
Beryllium	0.56	2,000	1.1 J	1.3	0.68	0.84	1.2	0.66	0.97	0.86	2.4	2.9	2.0	1.6	1.1	0.79	0.86	0.89	1.5
Cadmium	0.50	1,000	22	10 U	6.1 U	50	23 U	32 U	19 U	15 U	24 U	21 U	10	6.9 U	5.6	9.4	35 U	4.9 U	7.2 U
Chromium	13.0	1,500,000	50	10	4.4	22 J	11	4.9	62	22	220	30	38 J	47	8.6 J	9.2 J	12	6.8	290
Cobalt	8.9	20,000	630	250	440	110	8.2	4.4	500	430	760	570	560	440	140	70	10	880	93
Copper	12.0	41,000	3,700	2,400 J	2,100 J	3,600	190 J	140 J	1,900 J	1,900 J	24,000 J	2,200 J	3,400	2,200 J	3,400	2,000	400 J	2,600 J	34,000 J
Lead	20.9	1,288	**7,100**	800	79	**31,000**	76	74	1,200	550	**2,500**	530	520	810	450	250	**1,600**	120	**7,700**
Manganese	630	20,000	2,500	910	330	8,300 J	490	65	510	1,100	880	570	1,300 J	930	330 J	190 J	160	290	750
Mercury	0.05	310	0.43	0.43	0.046	0.065	0.028	0.036	0.10	0.23	0.024	0.056	0.047	0.09	0.053	0.038	0.075	0.038	0.012
Nickel	13.0	20,000	1,600	650	610	59	21	10	1,300	800	7,000	1,100	1,100	1,000	790	610	22	890	10,000
Selenium	0.37	5,100	15 U	6.9 J	4.4 J	4.7	1.8 J	2.8 J	8.1 J	5.7 J	4.8 J	5.8 J	5.5	4.0 J	5.7	4.7	1.7 J	3.5 J	3.6 J
Silver	0.50	5,100	58	14	48	140	0.39	0.48	10	21	43	13	34	18	8.9	3.9	1.8	77	29
Thallium	0.42	720	8.4	0.31 UJ	0.32 UJ	0.11 J	0.24 J	0.070 J	0.12 J	0.11 J	0.085 J	0.098 J	0.050 J	0.11 J	0.32 U	0.053 J	0.098 J	0.32 UJ	1.0 J
Vanadium	25.0	1,000	34	11	12	21	29	12	10	18	14	15	20	17	12	12	27	10	5.7
Zinc	60.2	310,000	180,000	190,000	170,000	39,000	25,000	39,000	180,000	150,000	130,000	200,000	150,000	120,000	210,000	190,000	7,700	130,000	140,000

Notes:

mg/kg = milligrams per kilogram

Shaded/colored boxing indicates concentration exceeds the Illinois Background Concentration and the USEPA Region 3 RBC.

U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limits.

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the samples.

R = The data are unusable. The sample result are rejected to serious deficiencies in meeting Quality Control criteria. The analyte may or may not be present in the sample.

UJ = The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

[1] Illinois Concentrations of Inorganic Chemicals in Background Soils, Non-Metropolitan Statistical Areas (35 IAC, Subtitle G, Chapter I, Section 742, Table G).

[2] USEPA Region 3 Risk-Based Concentration for Commercial/Industrial soils (USEPA Region III, 2005).

Table VI-1
Summary of SLERA Water/Dietary and Food Web Ecotoxicity Screening Values
Eagle Zinc Company Site
Hillsboro, Illinois

Analyte	Most Sensitive Piscivore[a] NOAEL-Based Benchmark (mg/L)	Deer Mouse[a] NOAEL (mg/kg BW-day)	Avian[a] NOAEL (mg/kg BW-day)
Metals			
Aluminum	0.025	---	---
Antimony	0.22	---	---
Arsenic	0.022	0.15	2.46
Barium	---	---	---
Beryllium	0.188	---	---
Cadmium	0.0004367	2.12	1.45
Calcium	---	---	---
Chromium	4.947	6,020	1
Cobalt	---	---	---
Copper	0.294	33.4	47
Iron	---	---	---
Lead	0.142	17.6	3.85
Magnesium	---	---	---
Manganese	---	---	---
Mercury	0.000001305	2.86	0.45
Nickel	2.104	87.9	77.4
Potassium	---	---	---
Selenium	0.0004318	0.44	0.5
Silver	---	48.8	17
Sodium	---	---	---
Sulfate	---	---	---
Thallium	NA	---	---
Vanadium	---	---	---
Zinc	0.085	352	14.5
Organic Compounds			
cis-1,2-Dichloroethene	---	---	---
Trichloroethylene	---	---	---

Notes:

---	Not available.
mg/kg BW-day	Milligrams per kilogram bodyweight per day.
mg/L	Milligrams per liter.
NOAEL	No Observed Apparent Effects Level.
SLERA	Screening level ecological risk assessment.

[a] Detailed description of the water/dietary food web ecotoxicity screening values is provided in Appendix D.

TABLE VI-2
On-Site SLERA Food Web Risk Calculations for the Deer Mouse and Identification of COPCs
Eagle Zinc Company Site
Hillsboro, Illinois

Constituent (a)	Maximum On Site Concentration (b) In Soil (mg/kg)	In Water (mg/L)	90th Percentile Uptake Factors (c) Vegetation (mg COPC/kg dw tissue)/ (mg COPC/kg dw soil)	Invertebrate	Estimated Dietary Tissue Concentrations (d) Vegetation (mg/kg)	Invertebrate	COPC Intake (d) From Soil (mg/kg bw-d)	From Water	From Vegetation	From Invertebrates	Maximum Estimated Dietary Ingestion (d) (mg/kg bw-d)	NOAEL Reference Toxicity Value (e)	NOAEL HQ (f) (Unitless)	Food Web COPC? (g) (yes/no)	Rationale (h)
Metals															
Arsenic	0.0092	ND	1.103	0.523	0.01	0.0048	0.0000417	NA	0.00211	0.00129	0.0034	0.15	0.02	no	HQ ≤ 1
Cadmium	0.0097	0.23	3.25	40.69	0.032	0.39	0.000044	0.0859	0.00676	0.105	0.2	2.12	0.09	no	HQ ≤ 1
Chromium	0.026	ND	---	3.162	NA	0.082	0.000118	NA	NA	0.022	0.022	6.020	0.000004	no	HQ ≤ 1
Copper	3	0.0026	0.625	1.531	1.9	4.6	0.0136	0.000971	0.401	1.24	1.7	33.4	0.05	no	HQ ≤ 1
Lead	0.93	0.0032	0.468	1.522	0.44	1.4	0.00422	0.00119	0.0929	0.376	0.47	17.6	0.03	no	HQ ≤ 1
Mercury	0.000042	ND	5	20.625	0.00021	0.00087	0.00000019	NA	0.0000444	0.000234	0.00028	2.86	0.0001	no	HQ ≤ 1
Nickel	0.88	0.036	1.411	4.73	1.2	4.2	0.00399	0.0134	0.253	1.13	1.4	87.9	0.02	no	HQ ≤ 1
Selenium	0.0012	ND	3.012	1.34	0.0036	0.0016	0.00000544	NA	0.00076	0.00043	0.0012	0.44	0.003	no	HQ ≤ 1
Silver	0.0058	ND	1	1	0.0058	0.0058	0.0000263	NA	0.00122	0.00156	0.0028	48.8	0.00006	no	HQ ≤ 1
Zinc	29	26	1.82	12.885	53	370	0.131	9.71	11.2	99.5	120	352	0.3	no	HQ ≤ 1

Notes:

[ ]	HQ > 1
---	Not available.
COPC	Constituent of Potential Concern.
NOAEL	No observed adverse effects level.
HQ	Hazard quotient.
dw	Dry weight.
mg/L	Milligrams per liter.
mg/kg	Milligrams per kilogram.
mg/kg bw-d	Milligrams per kilogram of body weight per day.
NA	Not applicable.
ND	Not detected.

(a) Only those constituents identified as bioaccumulative COPCs in USEPA 2000, "Bioaccumulation Testing And Interpretation For The Purpose Of Sediment Quality Assessment" are included.
(b) The occurrence of constituents is summarized on Table C-2a (of the RI) and Table ?-? (of the RI Addendum) for surface water and soil, respectively.
(c) Refer to Table D-4 (of the RI) for uptake factors and references.
(d) Formulae for estimated tissue concentrations and dietary ingestion scenarios are presented in Table D-2a (of the RI).
(e) Refer to Table D-1b (of the RI) for reference toxicity values.
(f) The HQ is the ratio of the maximum estimated dietary ingestion of a constituent to the appropriate reference toxicity value. HQs are rounded to 1 significant digit.
(g) A constituent is considered a COPC if it generates a HQ > 1 or if there is no reference toxicity value for that constituent.
(h) This explains why a constituent is (or is not) considered a COPC.

TABLE VI-3
On-Site SLERA Food Web Risk Calculations for the American Robin and Identification of COPCs
Eagle Zinc Company Site
Hillsboro, Illinois

Constituent (a)	Maximum On Site Concentration (b) In Soil (mg/kg)	Maximum On Site Concentration (b) In Water (mg/L)	90th Percentile Uptake Factors (c) Vegetation (mg COPC/kg dw tissue)/(mg COPC/kg dw soil)	90th Percentile Uptake Factors (c) Invertebrate (mg COPC/kg dw tissue)/(mg COPC/kg dw soil)	Estimated Dietary Tissue Concentrations (d) Vegetation (mg/kg)	Estimated Dietary Tissue Concentrations (d) Invertebrate (mg/kg)	COPC Intake (d) From Soil (mg/kg bw-d)	COPC Intake (d) From Water (mg/kg bw-d)	COPC Intake (d) From Vegetation (mg/kg bw-d)	COPC Intake (d) From Invertebrates (mg/kg bw-d)	Maximum Estimated Dietary Ingestion (d) (mg/kg bw-d)	NOAEL Reference Toxicity Value (e) (mg/kg bw-d)	NOAEL HQ (f) Unitless	Food Web COPC? (g) (yes/no)	Rationale (h)
Metals															
Arsenic	0.0092	ND	1.103	0.523	0.01	0.0048	0.000227	NA	0.000182	0.00116	0.0016	2.46	0.0007	no	HQ ≤ 1
Cadmium	0.0097	0.23	3.25	40.69	0.032	0.39	0.000239	0.0388	0.000582	0.0942	0.13	1.45	0.09	no	HQ ≤ 1
Chromium	0.026	ND	---	3.162	NA	0.082	0.000642	NA	NA	0.0198	0.02	1	0.02	no	HQ ≤ 1
Copper	3	0.0026	0.625	1.531	1.9	4.6	0.074	0.000439	0.0345	1.11	1.2	47	0.03	no	HQ ≤ 1
Lead	0.93	0.0032	0.468	1.522	0.44	1.4	0.0229	0.00054	0.008	0.338	0.37	3.85	0.1	no	HQ ≤ 1
Mercury	0.000042	ND	5	20.625	0.00021	0.00087	0.00000104	NA	0.00000382	0.00021	0.00021	0.45	0.0005	no	HQ ≤ 1
Nickel	0.88	0.036	1.411	4.73	1.2	4.2	0.0217	0.00608	0.0218	1.01	1.1	77.4	0.01	no	HQ ≤ 1
Selenium	0.0012	ND	3.012	1.34	0.0036	0.0016	0.0000296	NA	0.0000655	0.000386	0.00048	0.5	0.001	no	HQ ≤ 1
Silver	0.0058	ND	1	1	0.0058	0.0058	0.000143	NA	0.000105	0.0014	0.0016	17	0.00009	no	HQ ≤ 1
Zinc	29	26	1.82	12.885	53	370	0.716	4.39	0.964	89.4	95	14.5	7	YES	HQ > 1

Notes:

(box)	HQ > 1	dw	Dry weight.
---	Not available.	mg/L	Milligrams per liter.
1	HQ is between 1.0 and 1.5.	mg/kg	Milligrams per kilogram.
COPC	Constituent of Potential Concern.	mg/kg bw-d	Milligrams per kilogram of body weight per day.
NOAEL	No observed adverse effects level.	NA	Not applicable.
HQ	Hazard quotient.	ND	Not detected.

(a) Only those constituents identified as bioaccumulative COPCs in USEPA 2000, "Bioaccumulation Testing And Interpretation For The Purpose Of Sediment Quality Assessment" are included.
(b) The occurrence of constituents is summarized on Table C-2a (of the RI) and Table ?-? (of the RI Addendum) for surface water and soil, respectively.
(c) Refer to Table D-4 (of the RI) for uptake factors and references.
(d) Formulae for estimated tissue concentrations and dietary ingestion scenarios are presented in Table D-2b (of the RI).
(e) Refer to Table D-1c (of the RI) for reference toxicity values.
(f) The HQ is the ratio of the maximum estimated dietary ingestion of a constituent to the appropriate reference toxicity value. HQs are rounded to 1 significant digit.
(g) A constituent is considered a COPC if it generates a HQ > 1 or if there is no reference toxicity value for that constituent.
(h) This explains why a constituent is (or is not) considered a COPC.

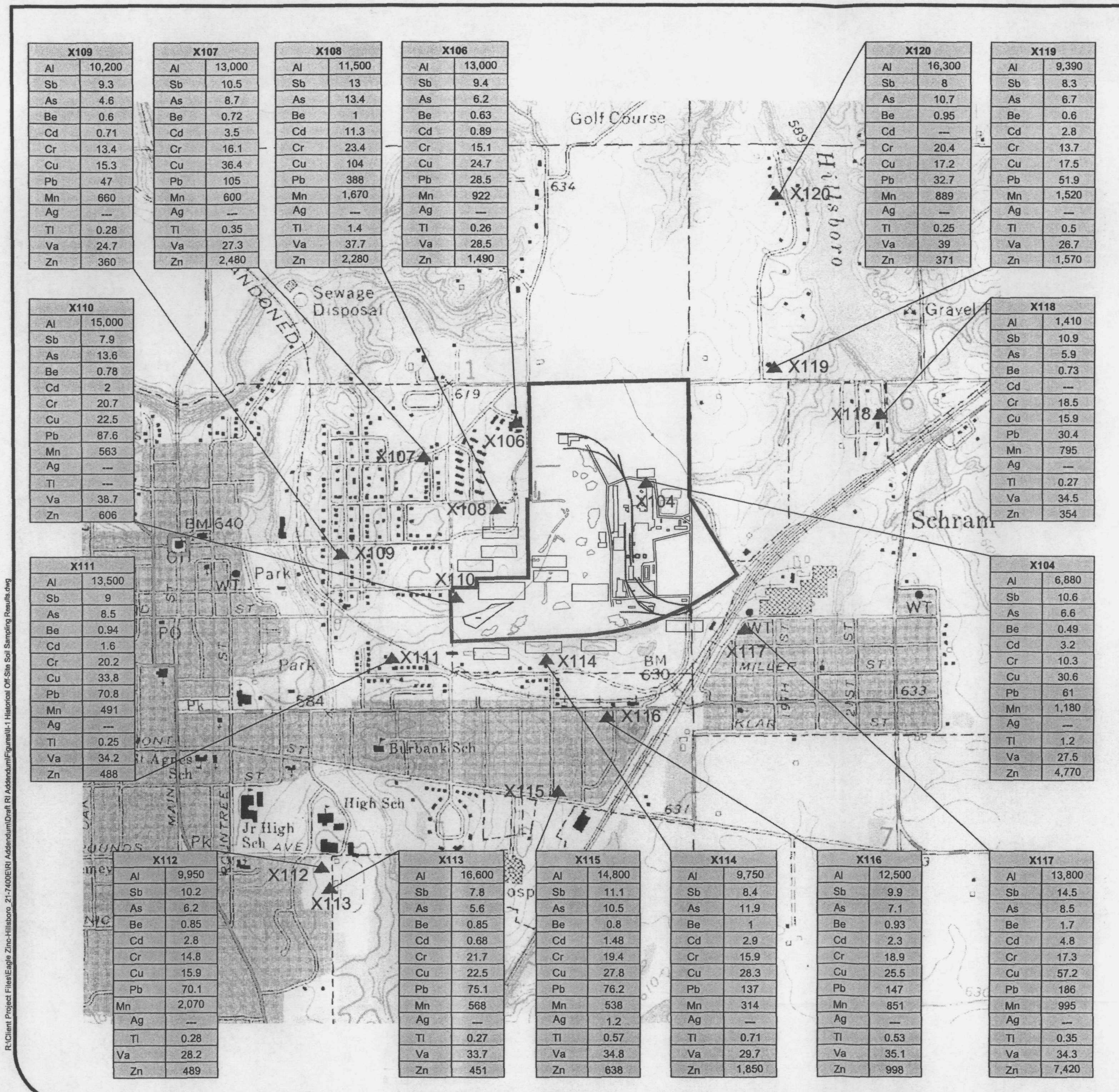
TABLE VI-4
On-Site SLERA Food Web Risk Calculations for the Red-Tailed Hawk and Identification of COPCs
Eagle Zinc Company Site
Hillsboro, Illinois

Constituent (a)	Maximum On Site Concentration (b) In Soil (mg/kg)	In Water (mg/L)	90th Percentile Uptake Factors for the Most Sensitive Mammal (c) (mg COPC/kg dw tissue)/ (mg COPC/kg dw soil)	Estimated Dietary Tissue Concentrations (d) Most Sensitive Mammal (mg/kg)	COPC Intake (d) From Water (mg/kg bw-d)	From Mammals	Maximum Estimated Dietary Ingestion (d) (mg/kg bw-d)	NOAEL Reference Toxicity Value (e)	NOAEL HQ (f) (unitless)	Food Web COPC? (g) (yes/no)	Rationale (h)
Metals											
Arsenic	0.0092	ND	0.016	0.00015	NA	0.0000114	0.000011	2.46	0.000004	no	HQ ≤ 1
Cadmium	0.0097	0.23	7.017	0.068	0.0185	0.00519	0.024	1.45	0.02	no	HQ ≤ 1
Chromium	0.026	ND	0.349	0.0091	NA	0.000694	0.00069	1	0.0007	no	HQ ≤ 1
Copper	3	0.0026	1.29	3.9	0.000209	0.297	0.3	47	0.006	no	HQ ≤ 1
Lead	0.93	0.0032	0.339	0.32	0.000257	0.0244	0.025	3.85	0.006	no	HQ ≤ 1
Mercury	0.000042	ND	1.046	0.000044	NA	0.00000336	0.0000034	0.45	0.000008	no	HQ ≤ 1
Nickel	0.88	0.036	0.898	0.79	0.0029	0.0603	0.063	77.4	0.0008	no	HQ ≤ 1
Selenium	0.0012	ND	1.263	0.0015	NA	0.000114	0.00011	0.5	0.0002	no	HQ ≤ 1
Silver	0.0058	ND	1	0.0058	NA	0.000442	0.00044	17	0.00003	no	HQ ≤ 1
Zinc	29	26	2.90106	84	2.09	6.41	8.5	14.5	0.6	no	HQ ≤ 1

Notes:

☐	HQ > 1		
1	HQ is between 1.0 and 1.5.	mg/L	Milligrams per liter.
COPC	Constituent of Potential Concern.	mg/kg	Milligrams per kilogram.
NOAEL	No observed adverse effects level.	mg/kg bw-d	Milligrams per kilogram of body weight per day.
HQ	Hazard quotient.	NA	Not available or not applicable.
dw	Dry weight.	ND	Not detected.

(a) Only those constituents identified as bioaccumulative COPCs in USEPA 2000, "Bioaccumulation Testing And Interpretation For The Purpose Of Sediment Quality Assessment" are included.
(b) The occurrence of constituents is summarized on Table C-2a (of the RI) and Table ?-? (of the RI Addendum) for surface water and soil, respectively.
(c) Refer to Table D-4 (of the RI) for uptake factors and references.
(d) Formulae for estimated tissue concentrations and dietary ingestion scenarios are presented in Table D-2c (of the RI).
(e) Refer to Table D-1c (of the RI) for reference toxicity values.
(f) The HQ is the ratio of the maximum estimated dietary ingestion of a constituent to the appropriate reference toxicity value. HQs are rounded to 1 significant digit.
(g) A constituent is considered a COPC if it generates a HQ > 1 or if there is no reference toxicity value for that constituent.
(h) This explains why a constituent is (or is not) considered a COPC.



X109	
Al	10,200
Sb	9.3
As	4.6
Be	0.6
Cd	0.71
Cr	13.4
Cu	15.3
Pb	47
Mn	660
Ag	---
Tl	0.28
Va	24.7
Zn	360

X107	
Al	13,000
Sb	10.5
As	8.7
Be	0.72
Cd	3.5
Cr	16.1
Cu	36.4
Pb	105
Mn	600
Ag	---
Tl	0.35
Va	27.3
Zn	2,480

X108	
Al	11,500
Sb	13
As	13.4
Be	1
Cd	11.3
Cr	23.4
Cu	104
Pb	388
Mn	1,670
Ag	---
Tl	1.4
Va	37.7
Zn	2,280

X106	
Al	13,000
Sb	9.4
As	6.2
Be	0.63
Cd	0.89
Cr	15.1
Cu	24.7
Pb	28.5
Mn	922
Ag	---
Tl	0.26
Va	28.5
Zn	1,490

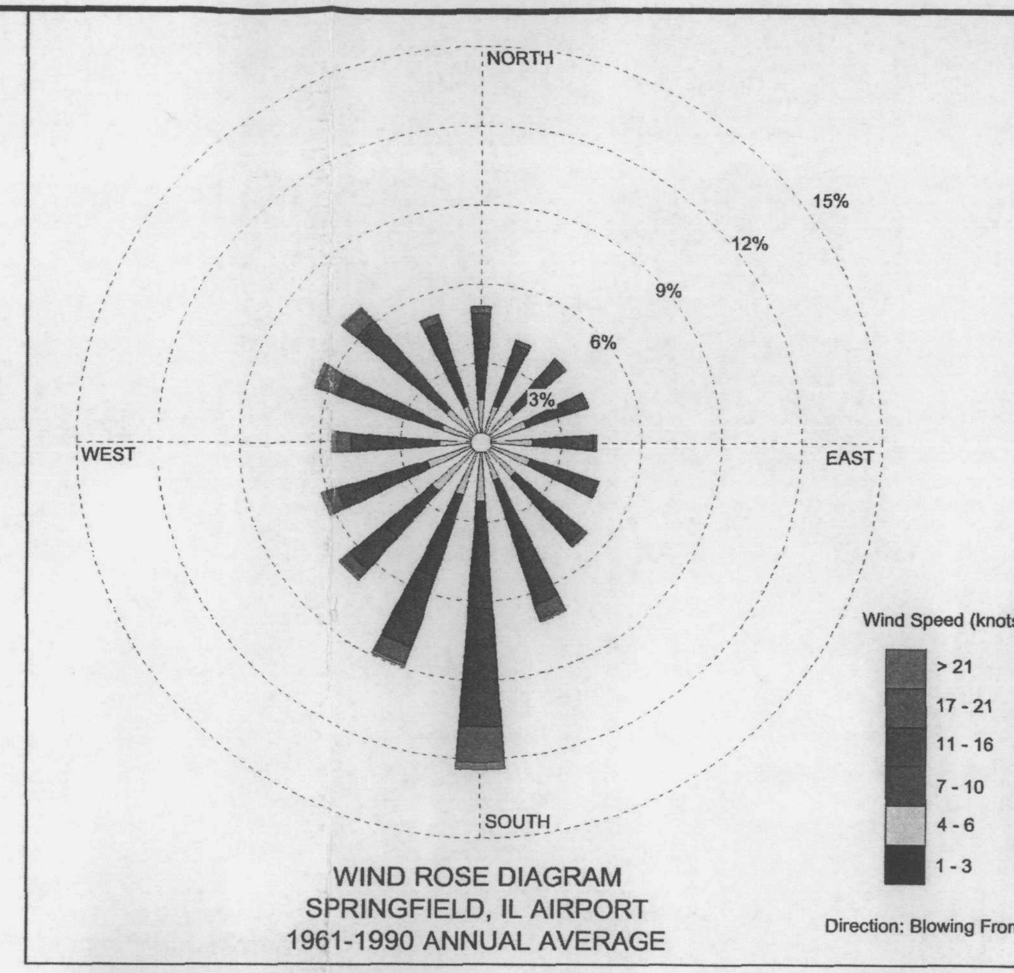
X120	
Al	16,300
Sb	8
As	10.7
Be	0.95
Cd	---
Cr	20.4
Cu	17.2
Pb	32.7
Mn	889
Ag	---
Tl	0.25
Va	39
Zn	371

X119	
Al	9,390
Sb	8.3
As	6.7
Be	0.6
Cd	2.8
Cr	13.7
Cu	17.5
Pb	51.9
Mn	1,520
Ag	---
Tl	0.5
Va	26.7
Zn	1,570

X110	
Al	15,000
Sb	7.9
As	13.6
Be	0.78
Cd	2
Cr	20.7
Cu	22.5
Pb	87.6
Mn	563
Ag	---
Tl	---
Va	38.7
Zn	606

X118	
Al	1,410
Sb	10.9
As	5.9
Be	0.73
Cd	---
Cr	18.5
Cu	15.9
Pb	30.4
Mn	795
Ag	---
Tl	0.27
Va	34.5
Zn	354

X111	
Al	13,500
Sb	9
As	8.5
Be	0.94
Cd	1.6
Cr	20.2
Cu	33.8
Pb	70.8
Mn	491
Ag	---
Tl	0.25
Va	34.2
Zn	488



WIND ROSE DIAGRAM
SPRINGFIELD, IL AIRPORT
1961-1990 ANNUAL AVERAGE

X104	
Al	6,880
Sb	10.6
As	6.6
Be	0.49
Cd	3.2
Cr	10.3
Cu	30.6
Pb	61
Mn	1,180
Ag	---
Tl	1.2
Va	27.5
Zn	4,770

X101-B/G	
Al	12,400
Sb	8.9
As	5.8
Be	0.8
Cd	---
Cr	16.2
Cu	20
Pb	148
Mn	434
Ag	---
Tl	0.33
Va	28.5
Zn	136

X102-B/G	
Al	10,000
Sb	9.2
As	5.7
Be	0.81
Cd	---
Cr	14.4
Cu	19.7
Pb	236
Mn	686
Ag	---
Tl	0.34
Va	27.1
Zn	138

SAMPLE ID	
Constituent	Concentration mg/kg

Al = Aluminum
Sb = Antimony
As = Arsenic
Be = Beryllium
Cd = Cadmium
Cr = Chromium
Cu = Copper
Pb = Lead
Mn = Manganese
Ag = Silver
Tl = Thallium
Va = Vanadium
Zn = Zinc

USEPA REGION 3 RBCs	
Al	78,000
Sb	31
As	0.43
Be	160
Cd	78
Cr	230
Cu	3,100
Pb	400
Mn	1,600
Ag	390
Tl	5.5
Va	78
Zn	23,000

▲ 1993 IEPA Surface Soil Sample

NOTES:

1. Concentrations in milligrams per kilograms.
2. Except for X104 and X110, all samples collected in 1993 by IEPA from ground surface at residential properties.

X112	
Al	9,950
Sb	10.2
As	6.2
Be	0.85
Cd	2.8
Cr	14.8
Cu	15.9
Pb	70.1
Mn	2,070
Ag	---
Tl	0.28
Va	28.2
Zn	489

X113	
Al	16,600
Sb	7.8
As	5.6
Be	0.85
Cd	0.68
Cr	21.7
Cu	22.5
Pb	75.1
Mn	568
Ag	---
Tl	0.27
Va	33.7
Zn	451

X115	
Al	14,800
Sb	11.1
As	10.5
Be	0.8
Cd	1.48
Cr	19.4
Cu	27.8
Pb	76.2
Mn	538
Ag	1.2
Tl	0.57
Va	34.8
Zn	638

X114	
Al	9,750
Sb	8.4
As	11.9
Be	1
Cd	2.9
Cr	15.9
Cu	28.3
Pb	137
Mn	314
Ag	---
Tl	0.71
Va	29.7
Zn	1,850

X116	
Al	12,500
Sb	9.9
As	7.1
Be	0.93
Cd	2.3
Cr	18.9
Cu	25.5
Pb	147
Mn	851
Ag	---
Tl	0.53
Va	35.1
Zn	998

X117	
Al	13,800
Sb	14.5
As	8.5
Be	1.7
Cd	4.8
Cr	17.3
Cu	57.2
Pb	186
Mn	995
Ag	---
Tl	0.35
Va	34.3
Zn	7,420

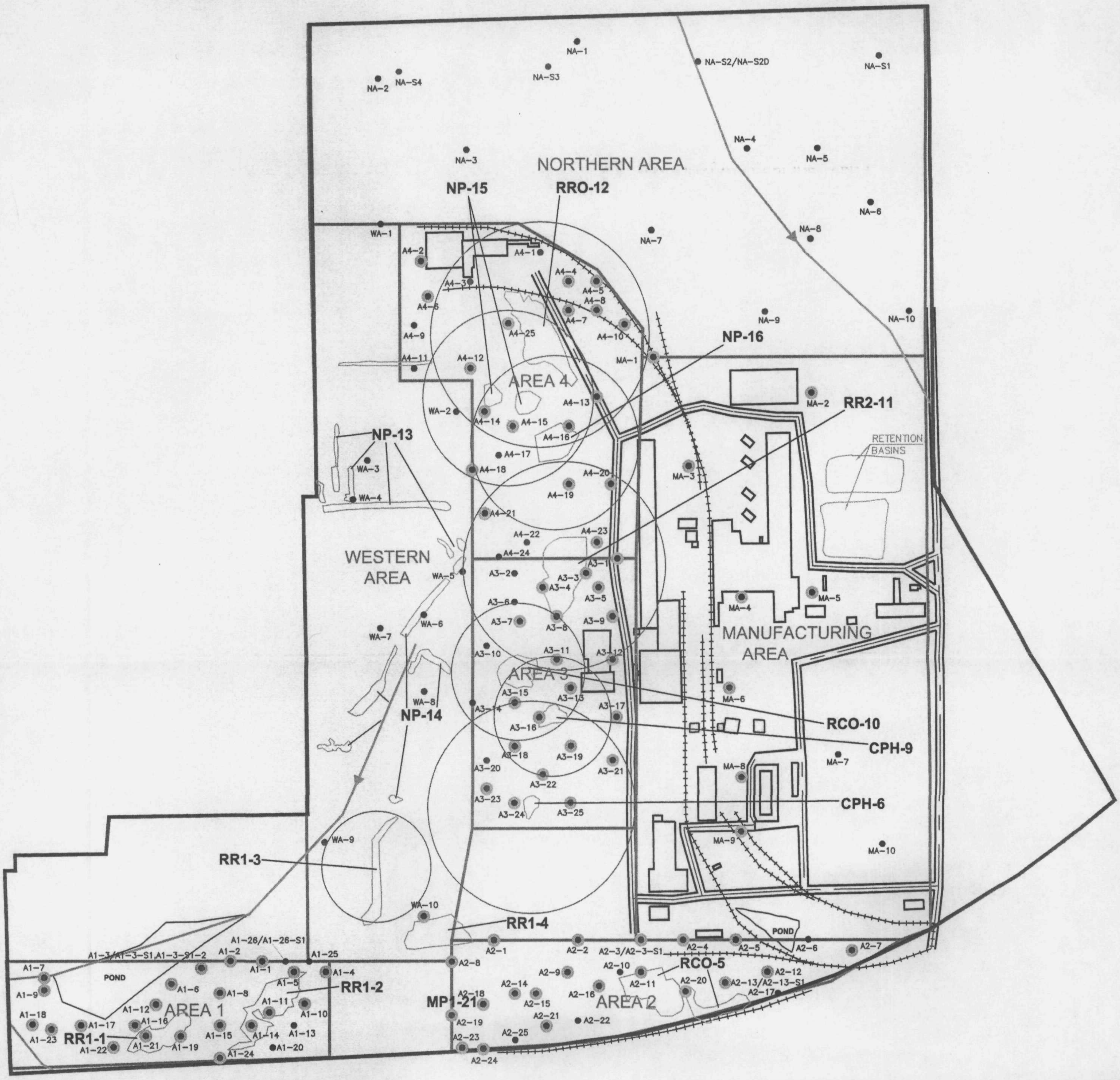
0 1200
SCALE IN FEET

ENVIRON

HISTORICAL OFF-SITE SOIL SAMPLING RESULTS
EAGLE ZINC COMPANY SITE
HILLSBORO, ILLINOIS

DATE: 04/08/05	CONTRACT NUMBER: 21-7400E		FIGURE II-1
DRAFTER: APR	APPROVED:	REVISED:	

R:\Client Project Files\Eagle Zinc-Hillsboro 21-7400E\RI Addendum\Draft RI Addendum\Figures\II-1 Historical Off-Site Soil Sampling Results.dwg



LEGEND

- SOIL BORING - SAMPLE NOT SENT TO LAB
- SOIL BORING - SAMPLE SENT TO LAB
- RESIDUE PILES
- STORMWATER DRAINAGEWAY
- SOIL BORINGS WITH MEASURABLE SURFACE RESIDUES
- DEPICTS RADIAL DISTANCE TO MAXIMUM AIR CONCETRATIONS OF BOTH 10 AND 30 MICRON PARTICLES (SEE TABLES IV-1, IV-2 AND APPENDIX E)

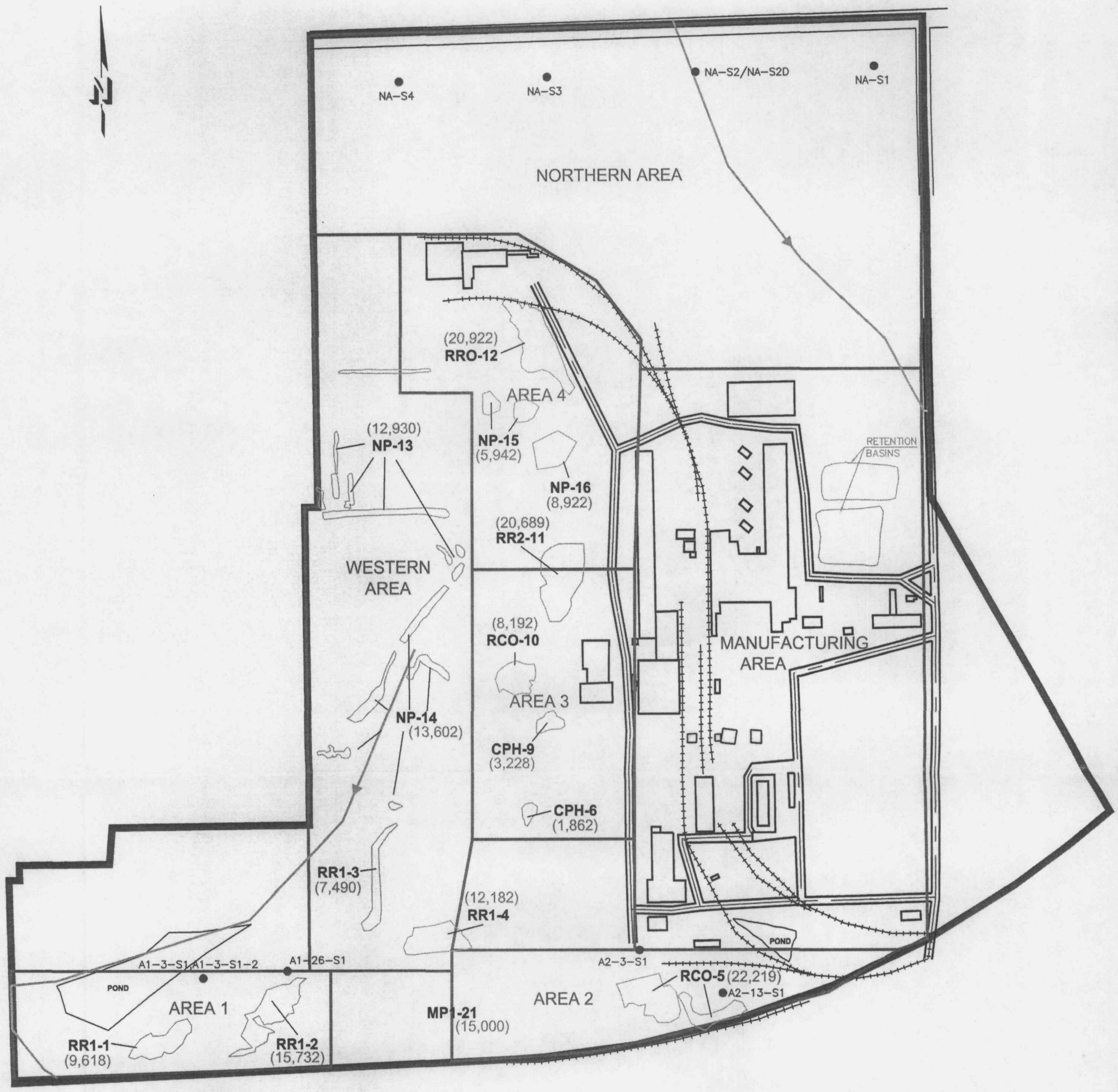
RR1 = ROTARY RESIDUE TYPE 1
RR2 = ROTARY RESIDUE TYPE 2
RCO = ROTARY CLEAN OUT
RRO = ROTARY RESIDUE OVERSIZE
CPH = CARBON PLANT HUTCH
MP = MISCELLANEOUS PILES
NP = NEWLY IDENTIFIED PILES

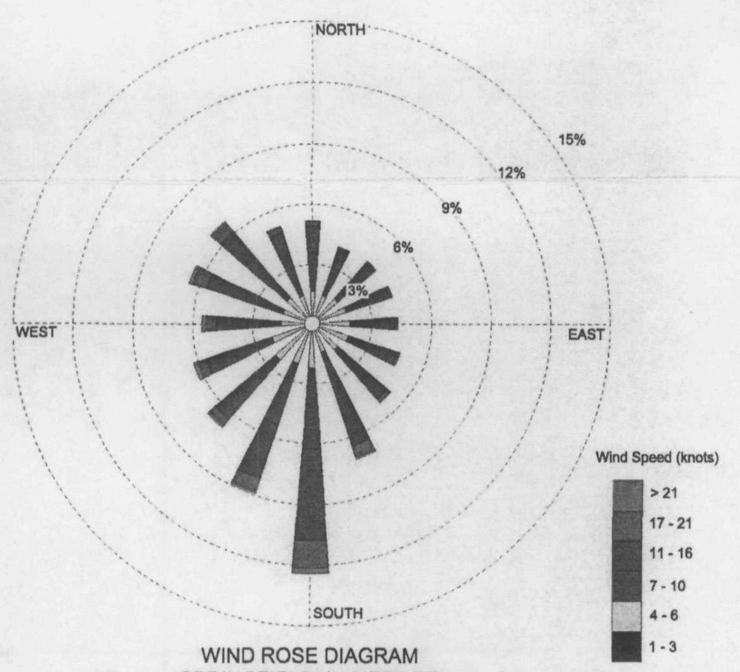
APPROX. SCALE (ft.)
0 320

R:\Client Project Files\Eagle Zinc-Hillsboro_21-7400E\RI Addendum\FINAL RI Addendum_February 2006\Figures\II-2 Soil Boring Locations.dwg

ENVIRON	SOIL BORING LOCATIONS EAGLE ZINC HILLSBORO, ILLINOIS	FIGURE II-2

DRAFTER: APR/ELS DATE: 02/17/06 CONTRACT NUMBER: 21-7400E APPROVED: REVISED:





WIND ROSE DIAGRAM
SPRINGFIELD, IL AIRPORT
1961-1990 ANNUAL AVERAGE

LEGEND

- ● SURFACE SOIL SAMPLE LOCATION - TAL METALS ANALYSIS
- RESIDUE PILES - TAL METALS AND PARTICLE SIZE ANALYSIS
- (1,862) SURFACE AREA (FT^2)
- STORMWATER DRAINAGEWAY

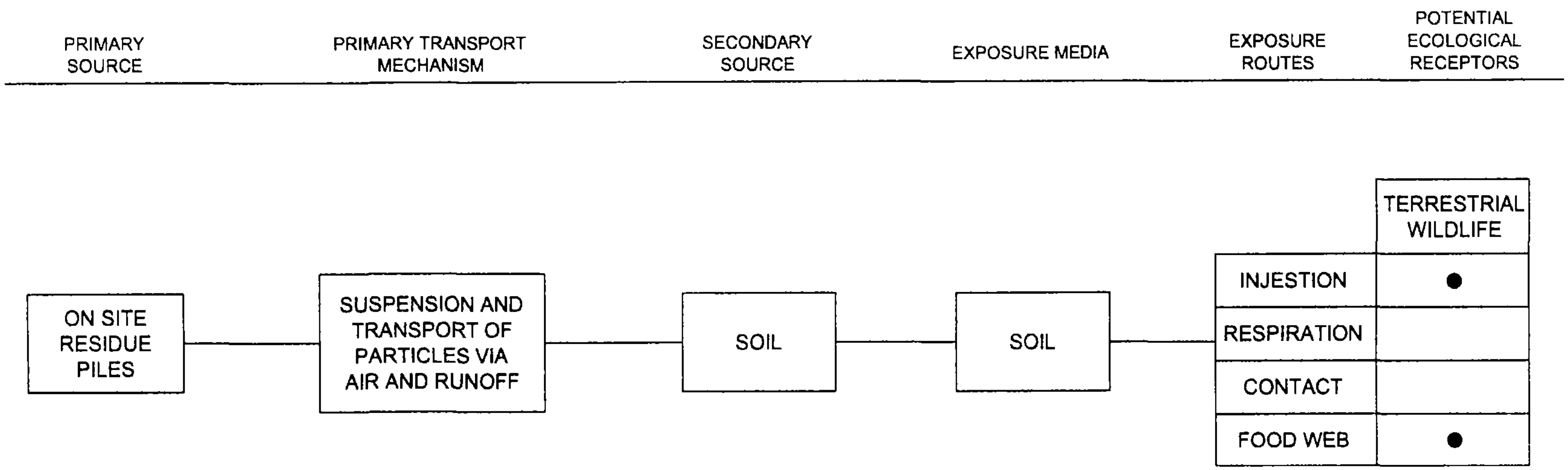
RR1 = ROTARY RESIDUE TYPE 1
RR2 = ROTARY RESIDUE TYPE 2
RCO = ROTARY CLEAN OUT
RRO = ROTARY RESIDUE OVERSIZE
CPH = CARBON PLANT HUTCH
MP = MISCELLANEOUS PILES
NP = NEWLY IDENTIFIED PILES

APPROX. SCALE (ft.)
0 320

R:\Client Project Files\Eagle Zinc-Hillsboro_21-7400E\RI Addendum\FINAL RI Addendum_February 2006\Figures\III-1_Sample Locations-RI Addendum.dwg

ENVIRON	SAMPLE LOCATIONS - RI ADDENDUM EAGLE ZINC COMPANY SITE HILLSBORO, ILLINOIS	FIGURE III-1

DRAFTER: APR DATE: 02/17/06 CONTRACT NUMBER: 21-7400E APPROVED: REVISED:



R:\Client Project Files\Eagle Zinc-Hillsboro_21-7400E\RI Addendum\Draft RI Addendum\Figures\VI-1 Conceptual Site Model.dwg

ENVIRON

CONCEPTUAL SITE MODEL FOR RESIDUE PILES, ECOLOGICAL PATHWAYS
EAGLE ZINC COMPANY SITE
HILLSBORO, ILLINOIS

Figure VI-1

Drafter: APR | Date: 04/12/05 | Contract Number: 21-7400E | Approved: | Revised:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

COPY

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FEB 24 2005
ENVIRON

REPLY TO THE ATTENTION OF:

February 21, 2005

Ross Jones
Environ Corp.
740 Waukegan Road
Suite 401
Deerfield, IL 60015

Re: Feb 2, 2005 Environ response to Agency approval of RI report
Eagle Zinc Site, Hillsboro, Illinois

Dear Ross:

I have received and evaluated your February 2, 2005, letter responding to U.S. EPA's letter dated January 27, 2005. U.S. EPA's letter approved the RI report with modifications as provided for by the RI/FS Consent Order for this Site. The following will respond to the matters raised in your February 2, 2005, letter.

General Comment 4. We are in agreement that the Respondents will collect and compile data concerning the residue piles as part of the RI report addendum. This Addendum will be submitted in advance of the draft FS report. Under the terms of the RI/FS Consent Order, the draft FS report is due on March 28, 2005 (60 days after Agency approval of the RI).

So that there is no further confusion, I want to make it clear that U.S. EPA expects the addendum to adequately address, at a minimum, the following:

The RI addendum shall address the potential for contaminant transport away from the piles. Potential transport mechanisms to be addressed will include leaching to the underlying soils, run off of leachate to surrounding soils, and suspension of wind blown dust to soils in on or off-site locations. A screening modeling approach should be completed for evaluation of potential transport, both for current and future conditions.

Specific modeling approaches are:

Air pathway analysis: Estimate dust emissions from the piles and chemical emissions (based on average concentrations) using the following guidance: "Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination, EPA/600/8-85/002, Office of Health and Environmental Assessment, Washington DC, 1985." Emissions should be based on both the limited and unlimited reservoir models, to provide reasonable and worst case estimates of emissions to the air.

The locations of the piles should be configured into area sources for purposes of air dispersion modeling. Estimate the downwind concentrations of chemicals in air using the SCREEN dispersion model. If a refined estimate of air concentrations is required, the ISCST model with actual meteorological data can be used. If ISCST is to be used, it is recommended that a modeling protocol be submitted to the EPA for evaluation in advance.

Estimates of the chemical deposition downwind should be estimated using a deposition velocity estimated as a function of settling velocity (calculated with Stokes Law). The particle size corresponding to TSP (30 um) can be used to estimate the deposition velocity. Once deposition flux has been calculated, the steady state concentration in a defined soil horizon, such as the top six inches, should be calculated using the procedure described in Baes and Sharp, 1983 (A Proposal for Estimation of Soil Leaching Constants for Use in Assessment Models. Journal of Environmental Quality. Vol. 12:17-28, 1983.

Residue pile data is available from 1993 and 1998 sampling (Section VI.C from the PSE report). This data can be used in this analysis along with other chemical data necessary to complete the pile analyses.

Runoff and leaching: TCLP data represents potential leaching concentrations to surrounding or underlying soil. Use of the TCLP data removes the need to calculate leachate concentrations as a function of K(d). The TCLP data along with seasonal precipitation data can be used with the procedure described in Baes and Sharp, 1983, to calculate the steady state concentration in a defined soil horizon, such as the top six inches of soil around or underlying a residue pile.

Specific comment 1: Your proposed revision to the approved language is acceptable and should be added to the RI Report.

Specific comment 5. Your clarification of the specific additional language to be added to the approved RI Report is acceptable.

Specific comment 11. The discussion of the piles and their potential impacts on the areas immediately adjacent to their locations, as well as to off-site areas, should be addressed in the RI addendum. Similarly, ENVIRON's conclusion that "full characterization has been provided in this regard through the collection of soil samples throughout the residue pile areas" should not be included until it is fully explained and supported in the RI addendum. It is recommended that you provide your rationale for your off-site data conclusions in advance of the submission of the addendum; your initial response to the Agencies comment has not been sufficient.

Specific comment 13. As indicated in your response letter, this comment is to be addressed in the RI addendum. The potential impacts should be evaluated and discussed in accordance with the outline provided above.

Specific comment 14. Your clarification of the specific additional language to be added to the approved RI Report is acceptable.

Specific comment 15. Your response did not include revised language for the RI stating that the lead may be site related. Please include this statement in the text revisions. There was no discussion of the nature and extent of these lead results in the SLERA. Your proposed language from the Jan 6 letter is not appropriate for the risk assessment. Your response goes to issues of risk management rather than risk assessment. Risk management will be addressed in the Feasibility Study report in the discussion of potential remedial action objectives, but the risks must first be fully evaluated and assessed.

Specific comment 19. Future ecological risks due to site related contaminants require further investigation because exposure may increase due to unacceptable levels present in the collected samples. Increased exposure to site related constituents may result from improvements in the physical conditions and habitat over an extended period of time.

EPA's comment contemplates that unless prompt redevelopment of the habitat areas is certain, some sort of monitoring in the drainage ways may be necessary to evaluate whether the site habitat conditions will improve if there is an extended period with minimal site activity. The following language should be added to the approved RI text: "Improvements to the physical condition and habitat of the site may result in unacceptable ecological risks that require further evaluation and require additional monitoring."

Specific comment 20. As the RI/FS Consent Order provides, the language required by U.S. EPA must be included in the text of the approved RI report.

Specific comment 21. See previous comment.

Specific comment 24. We are in agreement that this comment will be addressed in the RI report addendum.

Specific comment 26. We are in agreement that this comment will be addressed in the RI report addendum.

Please provide by February 25, 2005 the revised RI pages in response to specific comments 1, 5, 14, 15, 19, 20, and 21.

The other comments are to be addressed in the RI report addendum. We discussed the purpose and scope of the RI report addendum at our November, 2004, meeting and ENVIRON indicated that it would begin working on that report. The parties agreed to the addendum approach in part so that U.S. EPA could proceed to approve the draft RI report. By providing further clarifications in this letter, U.S. EPA hopes to help ensure that the Respondents can complete the addendum and the FS report as scheduled. Because my schedule has delayed this letter and so has delayed the finalization of the approved RI language by roughly two weeks, I am extending the due date for the FS by two weeks, to April 11, 2005.

If there are any questions, please contact me.

Sincerely yours,

Dion Novak

Dion Novak
Remedial Project Manager

Cc: R. Lanham, IEPA
L. Cundiff, CH2M Hill
T. Krueger, EPA
M. Mankowski, EPA

APPENDIX B

Responses to December 22, 2005 Comments on Addendum to RI Report

USEPA comments are provided in italics, followed by ENVIRON's response.

As the draft RI addendum notes, the waste piles onsite were not the subject of the original scope of work for the Remedial Investigation (RI). This was because the property owner assured EPA that it was going to arrange for off-site disposal of the piles, with Illinois EPA approval, prior to completion of the RI. Late in the RI process, the property owner notified EPA that the piles were not going to be removed. Because there is no plan in place for their future removal, the potential environmental impacts from the waste piles were to be evaluated in this RI addendum.

As EPA has pointed out previously, there are also no specific plans for the future use of the property. It currently sits idle, with limited site security. As a result, the piles could continue to have environmental impacts indefinitely, and could be disturbed at any time. While a deed restriction requires that the property be used for industrial purposes, that deed restriction does not place any restriction on movement or handling of the piles. EPA therefore required that this RI addendum include modeling to simulate the effect of potential disturbance of the piles on the site environment. Environ performed this modeling but did not use the results from the residue pile composite sample (the most bioavailable portion of the pile), so that Environ's modeling does not reflect the risks of pile contents being disturbed.

<u>Response</u>: At the time the scope of the Remedial Investigation was developed, the property owner communicated to USEPA its intent to continue to screen piled residue material for fines that would be sold for carbon content and its intent to seek other markets for the residue material piles. The property owner did continue to screen piled residue material and did transfer some piled residue material to Zinc Corporation of America. Due to the market price of metals and certain regulatory impediments to use as road bed or landfill cover, the property owner was unable to locate recipients for the remainder of the residue material piles.

As discussed in Section IV.B, Item 2 of the RI Addendum, ENVIRON calculated emission rates based on the assumption that the entire surface area of each pile is disturbed once per month. This conservative assumption is used to assess potential risks associated with current conditions at the site. As we discussed in our meeting on January 19th, USEPA accepts the conclusions for the current condition scenario. The conclusions drawn by USEPA for a hypothetical future scenario involving re-grading of the entire site and potential risks associated with dispersion of fine particles are incorporated into the revised RI Addendum.

EPA has therefore further evaluated the RI addendum sampling data to determine if the piles could be potential sources of contamination. Any action that involves disturbance of the residue piles (e.g. remedial action, redevelopment, regrading) may disperse substantial amounts of small residue particles into areas of natural or created vegetation or the waterways. EPA's evaluation uses a conservative approach that follows the RI protocol but uses the concentrations from the *residue composite sample instead of the samples used in Environ's analyses to calculate potential future risks.*

This scenario was requested as part of the RI nature and extent characterization but was not presented in the draft RI addendum, and is necessary to properly calculate potential future risks.

All other parameters that Environ used to calculate risk were used in these calculations. EPA's analysis assumes that the piles will be disturbed, either for redevelopment purposes or regrading/reconsolidation, which would release the fine grained particles represented by the composite sample collected by Environ.

Response: This statement is not accurate with regard to the human health risk calculations. The concentrations used by CH2MHill to evaluate risks to residential and industrial receptors are a subset of those published by USEPA Region 9. For its calculations, ENVIRON used standard and/or default exposure parameter values and equations published by USEPA (EPA/540/R-92/003 [RAGS Part B], 1991; OSWER Directive 9285.6-03 [Standard Default Exposure Factors], 1991), and USEPA Region 3. While the subset of the Region 9 soil PRGs that was used by CH2MHill is constrained to concentrations of 100,000 mg/kg or less (10 percent), the complete Region 9 PRGs as well as the calculations performed using these latter references result in risk-based concentrations (i.e., not artificially constrained) that are often greater than 100,000 mg/kg. For the Eagle Zinc site, this occurs for aluminum, iron, and zinc (with zinc being of primary interest).

Results for ecological risk

The aforementioned data analyses was done for the following ecological scenarios:

Soil*-using the residue pile composite concentrations in place of surface soil concentrations, the extended removal site evaluation (ESRE) (sic) shows high potential risk from the zinc concentrations in the composite sample to terrestrial wildlife. A high risk to American robins from lead may also be present, but was not determined because a less conservative avian ecotoxicity screening value was not available for the RI. If a conservative factor of 10 is assumed between the NOAEL and the LOAEL, the associated risk to the robin is high. Low to moderate risk is also associated with lead and selenium to the deer mouse (Table 2 of the attached report summarizes these results).*

Sediment*-using the residue pile composite concentrations in place of sediment concentrations (modeling impacts to sediment associated ecological receptors from fine grained residue), cadmium, cobalt, copper, lead, nickel, silver and zinc all had associated hazard quotients greater than 10 when based on the RI selected screening value. These metals are all associated with high risk to sediment-associated receptors. The remaining metals, except for chromium, also exceeded their respective ecotoxicity sediment screening values and are associated with a low to moderate level of risk (Table 3 of the attached report summarizes these results).*

Surface water-*Conservatively estimating surface water concentrations by multiplying the average surface water concentration (on-and off-site in both drainage ways) by the ratio of the composite pile sample fraction concentration to the average surface water concentration (on- and off-site in both drainage ways), aluminum, cadmium, copper, iron, nickel, and zinc had HQs greater than 10 for one or more receptors when using the RI selected screening value. These metals are all associated with high risk to surface water receptors from impacts from disturbed residue material. Arsenic and manganese also exceeded screening values for the RI selected screening value and are associated with a low to moderate level of risk.*

As identified in previous Agency comments, there are high concentrations of metals in surface water and sediment in the drainage ways but poor habitat quality limits present risk. However, this land could site idle indefinitely, which would allow the habitat area to expand and improve without interference from industrial operations. Future habitat improvements would significantly increase ecological risk through increased exposure, as outlined above.

Response: As discussed in the CH2M Hill Memorandum, several assumptions were made that differed from those made in the RI Report and RI Addendum. In addition, as characterized by CH2M Hill, the assumptions used in their evaluation were conservative (i.e., overly protective). We disagree that the assumptions used by CH2M Hill in the Tech Memo are valid for the purposes of risk assessment and or management. Five assumptions used by CH2M Hill and/or our observations concerning those assumptions are as follows:

- *The exposure concentrations for all residues are equal to the concentrations in the single Composite Sample (sample containing <75 micron size fraction).* Based on the data presented in the RI Addendum and in Hill's Tech Memo, it is known that this assumption is not accurate.
- *The fine residues are distributed over the entire surface of the site and in the drainageways.* Not only is this assumption extremely improbable in terms of the fate and transport characteristics of the material comprising the residue piles, it is impossible based on the knowledge that the <75 micron size fraction of the residue pile material generally composes only 2-5% of the material
- *The concentrations in the residue particles are 100 percent bioavailable to ecological receptors.* Bioavailabilities for metals in soil are known to be much less than 100%. Therefore, given that the media of interest is the residue pile material (in which the metal constituents would be bound even closer), this assumption is unsupportable.
- *Future surface water concentrations are estimated by multiplying the average measured surface water concentration with the ratio of the Composite Sample residue concentration to the average sediment concentration.* This approach is not supported in scientific literature or regulatory guidance.
- *Future habitat improvements would significantly increase ecological risk through increased exposure, as outlined above.* The potential for future habitat improvements to be associated with increased potential future risks do not appear to be significant because the primary issue related to the designation of "poor habitat quality" is the naturally-occurring lack of water in the drainages. Nevertheless, Sections VI and VII of the RI Addendum have been revised to reference the ecological risk evaluation presented in the CH2M Hill Memorandum.

Results for human health risk

EPA's evaluation also looked at potential human health risks associated with future industrial exposure scenarios at the site. Concentrations of lead and zinc were higher than industrial PRGs (Region 9) in most piles (Table 11 summarizes this analysis). Based on the results of this evaluation, concentrations of zinc in most piles would exceed a HQ of 1.

Response: The screening concentrations used by CH2MHill to evaluate potential risks to industrial receptors are a subset of those published by USEPA Region 9. As noted above, ENVIRON used standard and/or default exposure parameter values and equations published by USEPA (EPA/540/R-92/003 [RAGS Part B], 1991; OSWER Directive 9285.6-03 [Standard Default Exposure Factors], 1991, and USEPA Region 3 Risk Based Concentrations [RBCs]). Some of the Region 9 Preliminary Remediation Goals (PRGs) for soil are arbitrarily capped at 100,000 mg/kg (10% by weight). For certain naturally occurring metals, such as aluminum, iron, and zinc, the risk-based concentration can exceed 10%.

An analysis was also done for potential human health risks associated with future construction worker and recreational trespassers. Lead concentrations were higher than the construction PRG in four piles: MP1-21, RCO-10, RR1-3, and RR2-11 (See Table 13). Potential construction concentrations in air were modeled with SCREEN3 assuming that the piles were regraded and spread to a uniform depth of 6 inches. The results of this analysis indicate that 8 hour average concentrations of lead in air associated with construction emissions could exceed the OSHA action level of 30-micrograms/cubic meter.

Response: The risk analysis conducted by CH2M Hill for construction showed that the potential risks to those receptors would be less than the potential risks to industrial workers (a conclusion that ENVIRON agrees with). Therefore, the results of the human health risk assessment presented in the revised RI Addendum, which are focused on industrial workers, provide information that can also be used to address the protection of construction workers. Sections V and VII of the RI Addendum have been revised to reference the human health risk evaluation presented in the CH2M Hill Memorandum.

SPECIFIC COMMENTS

Page 1 1st bullet. This meeting summary was received but its content was never verified or commented on by the EPA, and EPA does not approve any conclusions presented in the meeting summary for inclusion in this document.

Response: The November 29, 2004 letter summarized our discussions during the November 18, 2004 meeting. The summary letter documents the agreement reached during the meeting to move forward with the work reported in the RI Addendum.

Page 1 3rd bullet. Please include a copy of the Feb 21, 2005 EPA letter in the appendices to this document.

Response: A copy of this letter is included as Appendix A.

Page 5 par 1. It states here that arsenic was not used or disposed of at the site. Coal is a source of arsenic and is documented as being used in the direct (American) process utilized at the site.

Response: Additional clarification has been added concerning the presence of arsenic in the residue materials.

Page 5. par 2. This conclusion from the IDPH appears to be related only to the levels of contaminants in the soil with respect to potential impacts on human health and was not intended to answer the question of whether this contamination had emanated from the site.

Response: See next response.

Page 5 par 3. Please delete this paragraph. As stated previously, the samples collected by the IEPA at off-site locations were not collected with site characterization as a goal. They were collected for health-based purposes.

Response: This paragraph has been deleted. However, while the February 22, 1994 letter from the IDPH made conclusions about potential health impacts to off-site residents based on the surface soil data collected by IEPA in 1993, as stated in the 1994 *CERCLA Expanded Site Inspection (ESI) Report* prepared by IEPA, the "expanded SI sampling is designed to satisfy HRS data requirements by documenting observed releases, observed contamination, and levels of actual contamination at targets."

Page 5 par 3. EPA disagrees that the sample concentrations decrease with distance from the site, as has been communicated previously.

Response: The fifth sentence of paragraph 1 on page 5 has been deleted.

Page 5 par 3. EPA also disagrees with the relation between the sample results and the pile characterization.

Response: This paragraph has been deleted.

Page 6 par 1. The residue piles were not investigated fully as potential contamination sources in the RI. They were not included in the original scope of the RI as the site owner anticipated their removal from the site. When this option did not transpire, EPA required their inclusion in the RI to more fully investigate potential sources of contamination at the site. The RI report did not fully characterize the residue piles as contamination sources, because detailed pile sample information was not available at the time the report was finalized-this statement should be removed. This addendum is providing the additional information necessary to characterize the piles as potential sources.

Response: The first sentence of this paragraph and the word "fully" in the third sentence have been deleted.

Page 6 par 2. How much residue was present in each of the areas before sampling? The primary objective of this sampling was to randomly characterize soil contamination; it was not designed to characterize exclusively what had migrated from the residue piles. Please distinguish amongst the samples collected-how many samples were collected at the ground surface and how many were collected at some depth due to surficial residue accumulation?

Response: The thickness of surface residue at each of the 130 soil borings conducted during Phase 1 of the RI is presented in Table III-1 and Appendix III-1 (Soil Boring Logs) of the RI Report. The subject paragraph notes how the soil areas were originally defined in 1998, but is not intended to discuss the primary objectives or the Phase 1 sampling rationale. This information is found in the Phase 1 Technical Memorandum and the RI Report.

The following sentences have been added to this paragraph: "The thickness of residue materials observed at each soil boring location is provided in Table III-1 of the RI Report. As indicated in this table, 22 of the 27 soil boring locations for which soil samples were submitted to the laboratory contained some surface residue material. In accordance with the approved sampling protocols, all soil samples were collected from the uppermost 12 inches of undisturbed native soil."

Page 6 par 2. A map illustrating where surficial residue was encountered at sampling locations would be helpful to quantify the nature and extent of residue material at the site that is not located in the various piles.

Response: A map showing the soil borings that encountered surface residue is provided as Figure II-2 and referenced in this paragraph.

Page 6 par 3. The SPLP samples were not collected from actual residue-they were collected from soil at the base of the residue-therefore, conclusions about the leachability of the residue cannot be supported by the data referenced here. The presence of metals in the soils under the residue piles is evidence that the pile contents have leached. A true leachability test would be of the residue pile contents-this would demonstrate the true potential for the pile's leachability.

Response: The SPLP samples consisted of residue material collected from the piles.

Page 7 1st complete par. The last two sentences should be removed, as they are entirely subjective and not supported by collected data. As was communicated in comments on the risk assessments, if exposure increases in the future due to improved habitat (and lack of smelter operational hindrance to local populations), potential future risks can increase. Also, as will be shown in comments on the air modeling later in this letter, EPA does not agree that there are no current releases from the residue piles. Additionally, as will be demonstrated later, the PRPs have not discussed potential surface water migration from the piles, which is a contributing factor to contaminant migration away from the piles.

Response: The last two sentences of this paragraph have been deleted.

Page 8 Section A.1. par 1. Please summarize the results of this characterization. What percentage of the piles was crusted? This information should be summarized in the text and be presented for each residue pile along with any crusting thickness data.

Response: This information is presented on the Residue Pile Characterization forms in Appendix D. Eight of the 15 piles/pile groups exhibited crusting/consolidation. Cross-sectional views through the piles showed crusting extended throughout the pile. Additional descriptive information has been provided in this section of the text.

Page 8 Section A.1. par 2. Please provide more detail on the characteristics of the samples collected-how much crusting was evident in the samples? How did the crusting impact the sample collection? How much of each pile was crusted and how thick was the crusting? Were the sample and the composite sample collected from the same location?

Response: As noted in the referenced paragraph, the samples were collected from non-crusted/non-consolidated portions of the piles. There was sufficient loose material across the entire surface area of each pile; the presence of crusting/consolidation, which was generally observed within the interior of each pile, did not impact sample collection. The six grab-sample locations used to prepare the composite samples were distributed evenly across each pile (or groups of piles). These residue samples were analyzed for TAL metals, and were biased towards smaller-sized material (i.e., large cobble-sized particles were not sampled). The single composite sample of very fine material (<75 micron) was obtained from the 15 grab samples submitted to the geotechnical laboratory for particle size analysis. This information has been added to the revised RI Addendum.

Page 9 Section A.1-1st full par. Where was the grab sample collected from for particle size analysis? From the same location as the analytical sample? Please provide more sample location information.

Response: The grab samples collected for particle size distribution and moisture content analysis were not collected at the same locations as the increment samples used for the TAL Metals composite samples, but were collected from representative surface material from each pile. The particle size samples were collected from the top of each pile. This information has been added to the revised RI Addendum.

Page 9 Section B.1. par 1 & 2. Please provide more information as to the purpose of this March 11 sampling-this was at the direction of the EPA.

Response: The work plan for data collection activities for the RI Addendum was transmitted to USEPA in an electronic mail transmission on March 10, 2005. USEPA required the collection of four additional surface soil samples in the southern area of the site. This information has been added to Section III of the revised RI Addendum.

Page 9 bullets. Were these samples collected from the ground surface? Please describe the sample locations.

Response: All of these samples were collected at the ground surface (0-0.5 feet bgs); however, as discussed in the RI Addendum, an additional soil sample (A1-3-S1-2) was collected at a depth of 0.5-1.0 feet bgs. The actual depth of the surface samples (0-0.5 feet bgs) has been added to this discussion.

Page 10 par 1. Was the second sample all soil? Or was there residue present? Please compare the results from the first sample with residue and the second, which had lower amounts of residue-what result, was Environ trying to measure here by taking the additional sample?

Response: The deeper sample at location A1-3 consisted of native soil. The surface sample at this location (0-0.5 feet bgs) contained a mixture of soil and residue material. A statement comparing the data for sample A1-3-S1 (collected at 0-6 inch depth) with sample A1-3-S1-2 (same location; collected 6 inches deeper) has been added to the text. The latter sample was collected to provide data at the same location, but for soil that was not mixed with residues.

Page 10 Northern area. Please locate sample NA-S2D on the referenced figure. Why is the screening level for zinc less than the residential soil RBC? What is the distance from these northern samples to nearby residue piles? Please see attached Hill report for contaminant nature and extent analysis, including potential surface water migration transport. There were no manufacturing operations in this area historically and the fact that zinc is present in the soils indicates that migration from historical sources has already occurred.

Response: The sample designations for the four Northern Area soil samples collected in March 2005 were inadvertently mislabeled on Figure III-1. This has been corrected in the revised RI Addendum, and NA-S2D has been added to the figure (NA-S2D is a duplicate of NA-S2).

The soil screening levels used during Phase 1 of the RI were Illinois TACO Tier 1 Soil Remediation Objectives (SROs). USEPA Region III's RBCs are a similar set of generic risk-based soil screening levels, but are not identical to the TACO SROs, reflecting slight variations in how the screening levels were calculated. For consistency, this discussion has been modified to include only comparison with the Region III RBCs.

As shown on Figure III-1 of the RI Addendum, the closest area to the Northern Area samples containing significant residues is approximately 600 feet to the south (residue material in soil Area 4). None of the four Northern Area sample locations were topographically down gradient of areas containing residues.

Page 15 last par. All piles were originally supposed to be evaluated with SCREEN-this was communicated to Environ on multiple occasions yet it seems that all piles were not evaluated in this manner from this text-why did Environ not follow EPA direction here? Please see the attached CH2M Hill air modeling analysis for additional information.

Response: As described in the draft RI Addendum text, each pile was considered for developing emission rates. Emission rates are required inputs for the SCREEN3 model. The AP-42 (Chapter 13.2.5) protocol used to develop emission rates due to wind erosion indicated certain piles did not have the potential to emit particles. Specifically, all the piles underwent the following analysis to develop the emission rates:

1. A threshold friction velocity was set to 1.12 m/s, referenced for an uncrusted coal pile.
2. The exposed surface area of each pile was divided into subareas; these subareas correspond to contours of normalized surface wind speeds. Each subarea is subjected to the same frequency of disturbances (once per month).
3. Using meteorological data from the Springfield, Illinois airport, the highest monthly wind speed was tabulated.
4. An equivalent friction velocity per subarea per pile was calculated using the tabulated fastest wind speeds.
5. If any of the calculated friction velocities (for each subarea of each pile for each disturbance) was greater than the threshold friction velocity determined in step one above, then erosion was assumed and an emission rate developed. If the calculated friction velocity was less than the threshold friction velocity, then wind erosion could not occur and, hence, the emission rate was assumed to be zero.

Since certain piles did not emit particles due to wind erosion, these piles were not further considered in the SCREEN3 model.

Page 20 par 1. Please see comments below regarding separating risk and soil sample results in the data presentation. The HHRA was not prepared with the residue pile sample data collected as part of this addendum and, as presented below, the Agencies believe that there is significant future risk associated with the residue piles, particularly with modeling using the composite sample.

<u>Response</u>: No response required.

Page 20 last par. Why was current data not used in this evaluation? It is unclear how this hypothetical scenario was created and the conclusion about overestimation of potential risk is unsupported without using real sampling data.

<u>Response</u>: The statement in this paragraph "... current Site data have not been used" refers solely to the use of soil concentrations predicted by dispersion modeling. The potential exposure media, exposure routes, and data used in the human health risk evaluation are summarized in Table V-1 of the RI Addendum. The text in this section has been revised to be more transparent.

Page 21 par 1. It cannot be assumed that the sorts of safety and waste handling procedures described in the RI addendum will be followed. There is no enforceable mechanism in place to prevent disturbance of the piles at any time in any way. Risks created by uncontrolled releases from disturbance of the piles must be evaluated. This analysis will, among other things, help identify whether and which specific engineering controls are necessary for adequate levels of protection (and compliance with ARARs). Please also see general comments about risk analysis for pile residue sampling.

Response: As discussed in our meeting on January 19th, the use of additional institutional controls and engineered barriers will be used to prevent disturbance of the piles. The issues will be discussed in the revised FS. The relatively brief exposure of construction workers involved with the actual disturbance or movement of the residue piles is considered in the CH2M Hill Memorandum, as residue data are compared with industrial and construction worker PRGs (Tables 11 and 13 in the memorandum, respectively).

Page 21 Section A. Please include dermal contact and incidental ingestion of residue material as a completed pathway-see general comments regarding risk scenarios.

Response: These exposure pathways have been added to the RI Addendum.

Page 23 Section D.1. The sample results in the residue piles are significantly above criteria and clearly relate to the samples collected near them. EPA has repeatedly requested that Environ relate the results of pile sampling to the soil samples collected nearby-this has not been done. Locations of soil exceedances in the surface soils when compared to analytical results from the residue piles located nearby indicates that areas near and downwind from the piles have been impacted by pile contents, from either airborne deposition or more significantly from surficial runoff from the piles. Please see general comments and Hill's memorandum for EPA's analysis of this issue. These measured impacts may increase with future pile disturbances.

Response: Section D.1 compares the March 2005 soil data with soil screening levels. The analysis presented in USEPA's comment letter has been incorporated into the RI Addendum.

Page 24 Section E par 1. Pile residue was quantified by collecting a composite sample under the surficially crusted material-this is an exposure medium. The risks associated with exposure to the residue are unacceptable as outlined above.

Response: The composite residue samples analyzed for TAL Metals were collected from loose, smaller-sized residue material on the surface of the piles. An evaluation of the risks associated with potential exposure to the residue pile material has been added to Section V of the RI Addendum.

Page 27 1st incomplete par. Please see attached Hill modeling and the general comments above for analysis of the impacts from the residue composite sample on ecological habitat.

Response: See responses to General Comments, "Results for ecological risk" above.

Page 27 receptors, par 2. Please see previous comment and the general comments.

Response: See responses to General Comments, "Results for ecological risk" above.

Page 30 conclusions. These will change based on the comments provided in this letter.

Response: Appropriate editorial changes were made to the Section VII Conclusions.

Table III-3. All of the piles are greater than the zinc screening levels provided here. The comparison done here should also include previous soil sample results, not just the extra data from March 2005.

Response: Table III-3 presents the data for the residue sample analyses conducted in March, 2005. In Table V-10, the residue data are compared with calculated Residue Screening Levels (RSLs) for inhalation of airborne particles originating from the piles. None of the zinc concentrations exceed soil screening levels for industrial receptors, which will be presented and evaluated in the revised FS Report.

Tables IV-1 and IV-2. These tables list the dispersion model results for 10 micron and 30-micron particle sizes, the maximum concentration, and the distance to maximum concentration by pile. A map illustrating this should be included in this report.

Response: This map has been included as Figure II-2. The radial distances from each pile presented on this figure are based on modeled calculations of distances to maximum concentrations of 10 and 30 micron particles in air from the center of each pile.

Tables IV-5 and IV-6. Where do these modeled soil concentrations for non-carcinogens and carcinogens occur?

Response: The modeling conducted using SCREEN3 and subsequent deposition calculations do not delineate the spatial extent of the soil concentrations or the precise locations of the maximum predicted concentration.

Tables V-5 through V-9. The Tier 1 screening level for lead listed should be revised to include the latest data from NHANES III.

Response: Based on the NHANES III document (OSWER #9285.7-52, March 2002), the Tier 1 screening level for lead will be the concentration designated for non-Hispanic, Caucasian women (1,288 mg/kg).

Tables V-7 to V-9. There are many more analytes listed in Table III-4 than in these tables. How was the analyte list narrowed from Table III-4 (March 2005 samples)-this should be added to the text?

Response: As discussed in Section V.B.2, only arsenic, iron, lead and vanadium exceeded the screening levels used to identify COPCs. These were the only compounds carried through the Tier 1 risk evaluation presented in Tables V-7, V-8 and V-9.

Illinois EPA recently completed a RCRA inspection at the site, which focused on the remaining site buildings and any issues associated with materials left inside the buildings. The results of this inspection were summarized in a report dated October 13, 2005-please copy EPA on your response to this report. In subsequent correspondence, they have expressed concern about the surface impoundments in the central part of the site as lacking proper RI characterization.

Please provide any historical information that you may have as these were also not included in the original RI scope.

Response: Copies of two letters transmitted to IEPA in response to the October 13, 2005 report were previously provided to USEPA. We assume the subsequent correspondence from IEPA refers to the engineered storm water retention system that was constructed in the east-central portion of the site in 2001. This system includes a small concrete settlement structure and a clay-lined retention pond. This storm water retention system receives storm water runoff from a small, largely paved portion of the former manufacturing area. It does not receive runoff from residue piles and, therefore, was not identified for further investigation in the RI.

Also, EPA has been in contact with the City of Hillsboro and they have indicated their desire to remove the buildings left at the site before they consider any potential future use of the site. Like the waste piles, the buildings were not part of the original RI scope. The buildings were excluded because at the time, they were part of an operating facility that would be addressed under ongoing obligations to comply with environmental and health and safety requirements. Contamination in the buildings would need to be appropriately addressed in any building demolition. Please provide EPA with a copy of your response to this issue and procedures for assuring appropriate consideration of the buildings during any potential demolition or removal.

Response: As discussed during our January 19, 2006 meeting, the removal of the buildings to facilitate hypothetical re-development scenarios will not be considered in the revised FS. As discussed below; however, the issue of site security in and around the buildings will be considered in the revised FS.

Site security is also a potential issue that must be addressed, both for short term as well as to ensure the integrity of any remedial action taken at the site. Evidence of trespassing at the site has been noted during site visits.

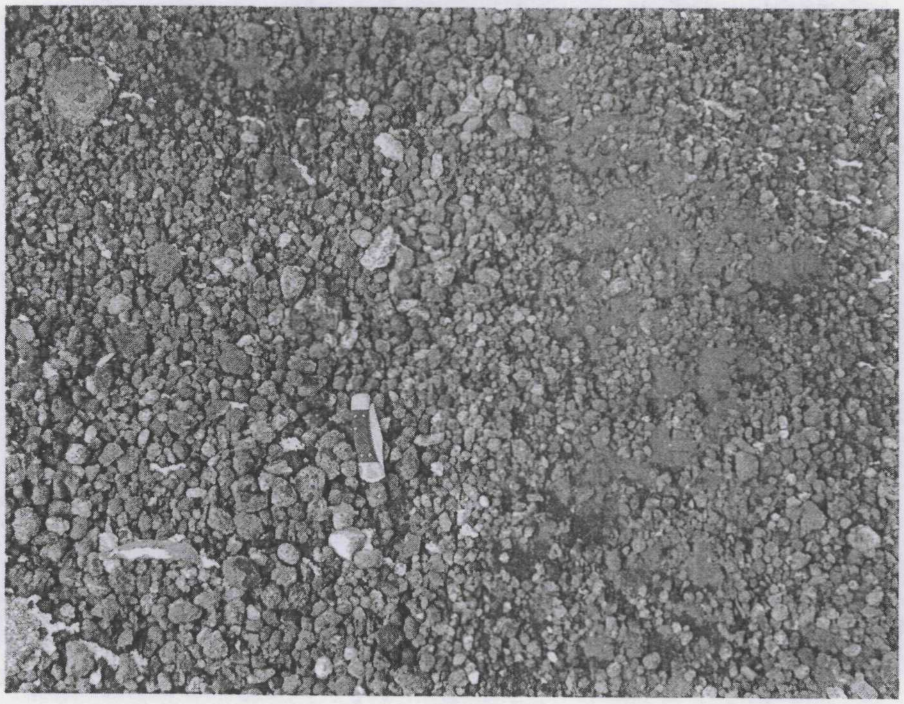
Response: As discussed during our January 19, 2006 meeting, the issue of site security will be considered in the revised FS.

The draft Feasibility Study submitted earlier this year does not address the nature and extent issues presented in the comments above. EPA expects that the FS will be revised to include active remediation technologies that address the risks outlined in EPA comments, satisfy appropriate ARARs and present details on effectiveness, implementability and cost.

Response: As discussed in our January 19th meeting, the revised FS will evaluate active remedial technologies.

Appendix C
Eagle Zinc – Residue Piles Photo Log

Photograph 1: Pile RRO-12, looking west.



Photograph 2: Pile RRO-12, view downward at top of pile.

Photograph 3: Pile NP15, view from top of pile looking north.

Photograph 4: Pile NP-15, looking west.

Photograph 5: Pile NP-15, looking west.

Photograph 6: Pile NP-16, looking west.

Photograph 7: Pile NP-16, side view of pile looking south.

Photograph 8: Pile NP-16, view downward at top of pile.

Photograph 9: Pile RR2-11, looking west.

Photograph 10: Pile RR2-11, looking downward at the pile.

Photograph 11: Pile RCO-10, looking southwest.

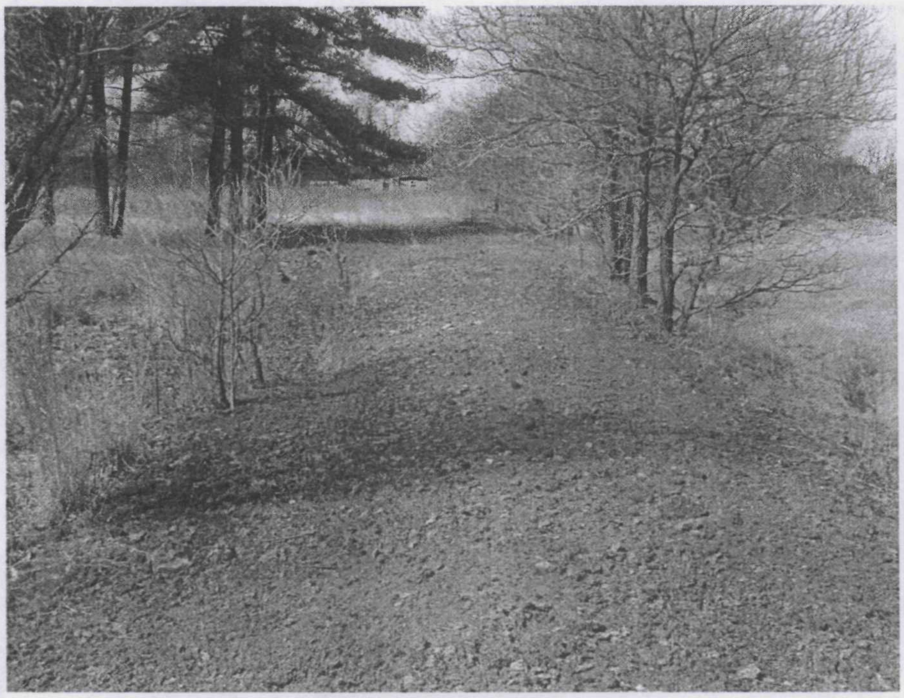
Photograph 12: Pile RCO-10, view downward near the top of the pile.

Photograph 13: Pile CPH-9, looking west.

Photograph 14: Pile CPH-9, looking west from top of pile.

Photograph 15: Pile CPH-9, looking east at top of pile.

Photograph 16: Pile CPH-9, looking north.



Photograph 17: Pile NP-13, looking west.

Photograph 18: Pile NP-13, looking downward at residue material.

Photograph 19: Pile NP-14, looking southwest.

Photograph 20: Pile CPH-6, looking southwest.

Photograph 21: Pile CPH-6, looking southwestward at side of pile.

Photograph 22: Pile RCO-5, looking west.

Photograph 23: Pile RCO-5, close-up of typical materials.

Photograph 24: Pile RCO-5, looking south.

Photograph 25: Pile RR1-4, looking north.

Photograph 26: Pile RR1-4, looking downward at top of pile.

Photograph 27: Pile RR1-3, looking north at west side of pile.

Photograph 28: Pile RR1-3, looking downward at top of the pile.

Photograph 29: Pile RR1-3, looking south along west side of the pile.

Photograph 30: Pile MP1-21, looking east.

Photograph 31: Pile MP1-21, looking north.

Photograph 32: Pile MP1-21, looking downward at the top of the pile.

Photograph 33: Pile RR1-2, looking south.

Photograph 34: Pile RR1-2, looking downward at residue materials.

Photograph 35: Pile RR1-1, looking south.

Photograph 36: Pile RR1-1, looking downward at residue materials.

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID RR0-12

Date 3/11/2005

Height Average - 15 feet

Surface Area 20,922 sq. ft.

Description: Gray to Brown slag. Particle sizes range from silt/sand size up to 3 in. Larger particles are somewhat rounded. Approximately 20% of exposed particles are > 2 in. Photos 1 and 2.
Crusting Evaluation Notes: No crusting. Fine-grained matrix (sand/silt size) partially exposed at top of pile.
Percent non-erodible elements (>1cm) at surface of the pile: 60-80%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID NP-15
Date 3/11/2005
Height Pile 1: 4-12 ft; Pile 2: 4-5 ft.
Surface Area 5,942 sq. ft.

Description: Miscellaneous brown to gray to whitish slag in two separate piles, partially consolidated. Particles up to 18 in. Photo 3, 4 and 5.
Crusting Evaluation Notes: Some of the piles consit of hard aggegates of slag fragments. Pile surfaces are 15% crusted overall. Crusting is > 2 ft. thick. Approximately 50% of surface particiles are > 2 in.
Percent non-erodible elements (> 1cm)at surface of the pile: 60-80% (both piles)

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	NP-16
Date	3/11/2005
Height	4-25 ft.
Surface Area	8,922 sq. ft.

Description: Gray to brown slag, bricks and other debris. Particle sizes range from silt/sand size up to 10 in. Larger particles are somewhat rounded. Photos 6, 7 and 8.
Crusting Evaluation Notes: No crusting.
Percent non-erodible elements (> 1cm) at surface of the pile: 70-90%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	RR2-11
Date	3/11/2005
Height	20-30 ft.
Surface Area	20,689 sq. ft.

Description: Gray to brown slag. Particle sizes up to 6 in. (1/2 "-2" common). Contains a sand/silt-size matrix. Photos 9 and 10.
Crusting Evaluation Notes: No crusting, but pile contains some blocks of fused slag. Pile surface is loose overall.
Percent non-erodible elements (> 1cm) at surface of the pile: 40-65%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID RCO-10
Date 3/11/2005
Height 4-20 ft.
Surface Area 8,192 sq. ft.

Description: Light to dark gray slag. Typically sand/silt to 1 in. particle size with occassional arger fragments. Photos 11 and 12.
Crusting Evaluation Notes: 1-2%; mainly at top of pile
Percent non-erodible elememts (> 1cm) at surface of the pile: 10-50% (Average - 20%)

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	CPH-9
Date	3/11/2005
Height	6-18 ft.
Surface Area	3,228 sq. ft.

Description: Main conical pile of fire-grained light gray slag with larger piles extending southwest of main pile. Material is hard and compacted. Pile has a coating of loose material at the surface. Dominant particle size is <1/2" - 1/2". Photos 13 and 14.
Crusting Evaluation Notes: Entire pile is consolidated; some loose material on top.
Percent non-erodible elements (> 1cm)at surface of the pile: 0-10%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	NP-13
Date	3/11/2005
Height	1 to 3 ft.
Surface Area	12,930 sq. ft.

Description: Dark gray to black slag, mostly in 1/2 "-3" range. Elongated piles. Some have a coating of vegetative matter (pine needles, etc.) and soil. All piles are borded by tall grass (grass is taller than piles). Photos 17 and 18.
Crusting Evaluation Notes: No crusting.
Percent non-erodible elements (> 1cm) at surface of the pile: 70-100%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	NP-14
Date	3/11/2005
Height	0.5-3ft.
Surface Area	13, 602 sq. ft.

Description: Dark gray to black slag, mostly in 1/2 "-3" range. Elongated piles. Some have a coating of vegetative matter (pine needles, etc.) and soil. All piles are borded by tall grass (grass is taller than the piles). Photo 19.
Crusting Evaluation Notes: No crusting.
Percent non-erodible elements (> 1cm) at surface of the pile: 70-100%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	CPH-6
Date	3/11/2005
Height	15 ft.
Surface Area	1,862 sq. ft.

Description: Conical light gray slag pile. Contains large slabs of previously crusted material intermixed with relatively fine (1/8" - 1/4") particles (pile disturbed by trackhoe during previous sampling). Photos 20 and 21.
Crusting Evaluation Notes: Consolidated/crusted blocks make up approximately 30% of pile surface area.
Percent non-erodible elements (> 1cm) at surface of the pile: 30% (due to consolidated, crusted blocks).

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	RC0-5
Date	3/11/2005
Height	2 - 5 ft.
Surface Area	22,219 sq. ft.

Description: Multiple truck-load piles of large, miscellaneous slag, refractory brick and other debris. Colors: brown, gray, black and whitish. Sand-size up to >12 in. Photos 24, 25 and 26.
Crusting Evaluation Notes: Not crusted.
Percent non-erodible elements (> 1cm) at surface of the pile: 30-100% (average - 60%)

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	RR1-4
Date	3/11/2005
Height	6 ft.
Surface Area	12,182 sq. ft.

Description: Brown to gray slag. Sand size to 2 in. Mostly in range of 1/2" - 1". Loose on top; highly consolidated/hard within interior of pile. Photos 27 and 28.
Crusting Evaluation Notes: 1% piles contains between 0 - 1 ft. loose material over hard crusted material.
Percent non-erodible elements (> 1cm) at surface of the pile: 50%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	RR1-3
Date	3/11/2005
Height	5 - 8 ft.
Surface Area	7,490 sq. ft.

Description: Brown to dark gray slag. Interior of pile consists of large masses of fused particles. Loose material on top of pile (sand size - 2 in.) Photos 29, 30 and 31.
Crusting Evaluation Notes: 10% - only on sides of pile.
Percent non-erodible elements (> 1cm) at surface of the pile: 50% - 70% (includes particles >1cm, as well as fused masses exposed on sides of pile)

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	MP1-21
Date	3/11/2005
Height	3 - 6 ft.
Surface Area	unknown sq. ft.

Description: Dark gray to brown to orange (oxidized) largely consolidated slag. Mainly consists of fine grained particles (up to 1/8" - 1/4"). Loose material on top of piles. Photos 32, 33 and 34.
Crusting Evaluation Notes: Piles are consolidated, but covered by 1 - 3 " loose material at top.
Percent non-erodible elements (> 1cm) at surface of the pile: 10 - 50%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	RR1-2
Date	3/11/2005
Height	2 - 4 ft.
Surface Area	15,732 sq. ft.

Description: Large brown to gray to whitish slag; 3 - 12" particles common. Some intermixed fines. Exists in "truck load" piles. Photos 35 and 36.
Crusting Evaluation Notes: 1%, very localized.
Percent non-erodible elements (> 1cm) at surface of the pile: 70 - 80%

RESIDUE PILE PHYSICAL CHARACTERIZATION

Pile ID	RR1-1
Date	3/11/2005
Height	2 - 4 ft.
Surface Area	9,618 sq. ft.

Description: Large brown to gray to whitish slag; 3 - 12" particles common. Some intermixed fines. Exists in "truck load" piles. Photos 37 and 38.
Crusting Evaluation Notes: None
Percent non-erodible elements (> 1cm) at surface of the pile: 70 - 80%

STS CONSULTANTS

STS Consultants, Ltd.
750 Corporate Woods Parkway
Vernon Hills, Illinois 60061
voice 847-279-2500
fax 847-279-2510
web www.stsconsultants.com

March 23, 2005

Mr. Christopher Greco
Environ International Corporation
123 North Wacker Drive
Chicago, Illinois 60606

RE: Laboratory Testing Program For The Eagles Zinc Project – STS Project No. 34601

Dear Mr. Greco:

We are pleased to submit two (2) copies of our laboratory report that pertains to the testing of fifteen (15) soil samples received in our laboratory March 14, 2005. The samples were in reference to the Eagles Zinc project. As per your request, STS Consultants, Ltd. performed the following tests on each sample:

- Particle Size Analysis -- ASTM D 422
- Moisture Content -- ASTM D 2216

The test data included in this report only represent the samples tested and may not reflect actual site materials and/or conditions. The scope of services provided by STS Consultants, Ltd. did not include interpretation of the laboratory test data, and therefore, we are not liable for any interpretation performed by others. If you wish us to provide you with this service, we would be happy to discuss this matter with you at your convenience. Any reproduction of this report must be done in its entirety.

We are pleased to have the opportunity to provide you with our testing services. Should you have any questions, or require additional assistance, please feel free to contact us at any time.

Respectfully,

STS CONSULTANTS LTD.

William P. Quinn
Laboratory Manager

Charles W. Pfingsten, PE
Principal Engineer

Encl.

STS Consultants Ltd.
Consulting Engineers

Moisture Content Data Sheet
ASTM D 2216

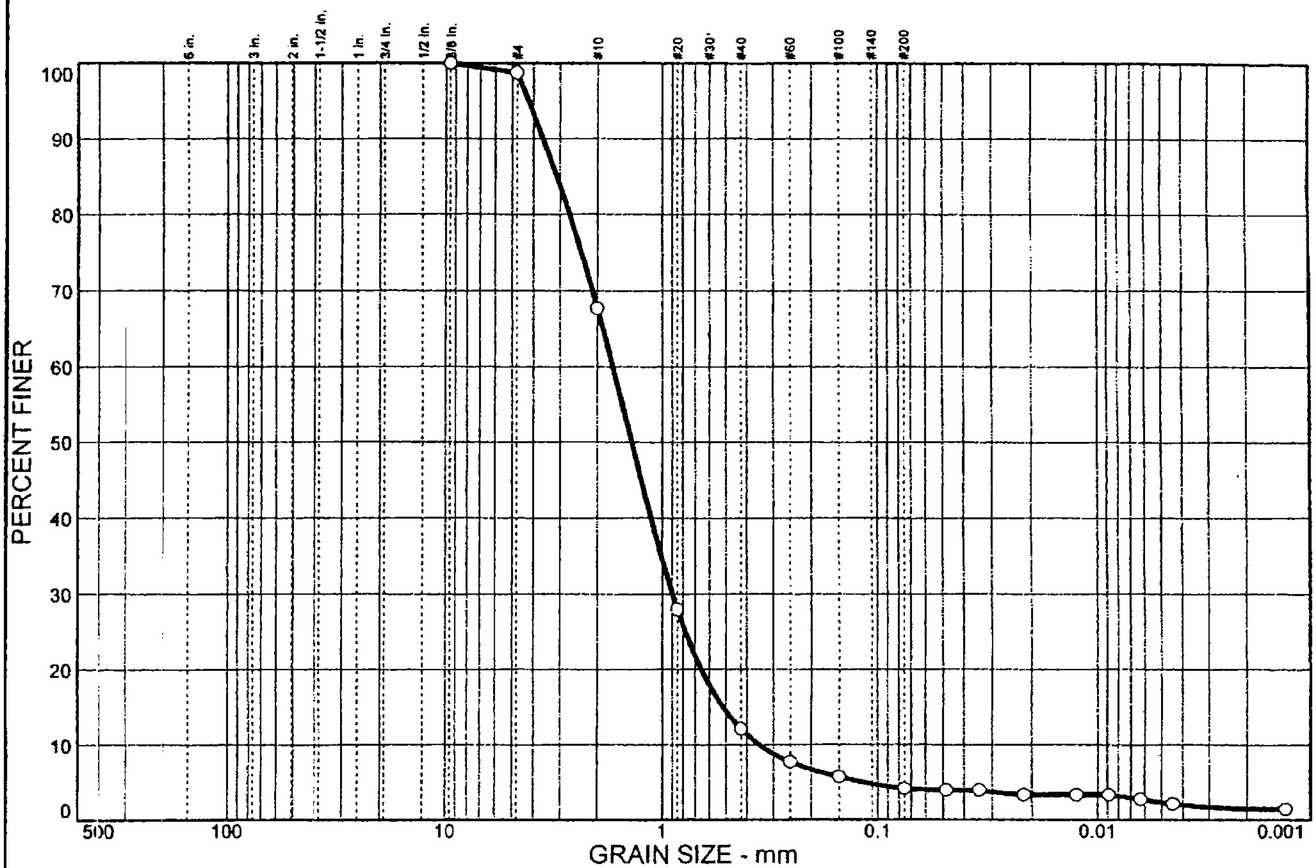
STS Project No.: 34601
Project Name: Eagles Zinc Project
Date: 3/14/2005

Boring Number	Sample No. Number	Depth (ft)	WC (%)
---	CPH-6	---	5.0
---	CPH-9	---	5.0
---	MP1-21	---	11.0
---	NP-13	---	5.2
---	NP-14	---	6.8
---	NP-15	---	4.9
---	NP-16	---	6.4
---	RR0-12	---	8.4
---	RR1-1	---	8.6
---	RR1-2	---	4.9
---	RR1-3	---	7.5
---	RR1-4	---	6.7
---	RR2-11	---	4.4
---	RCO-5	---	8.0
---	RCO-10	---	8.8

Techncian: Ken Proctor

Checked By: W. P. Quinn

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.2	31.1	55.6	8.0	1.8	2.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	98.8		
#10	67.7		
#20	28.0		
#40	12.1		
#60	7.7		
#100	5.7		
#200	4.1		

* (no specification provided)

Soil Description

F-C SAND SIZED SLAG TRACE CLAY TRACE SILT TRACE FINE GRAVEL - LT. GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.11 D_{60}= 1.70 D_{50}= 1.39
D_{30}= 0.896 D_{15}= 0.517 D_{10}= 0.349
C_u= 4.86 C_c= 1.36

Classification

USCS= SP AASHTO=

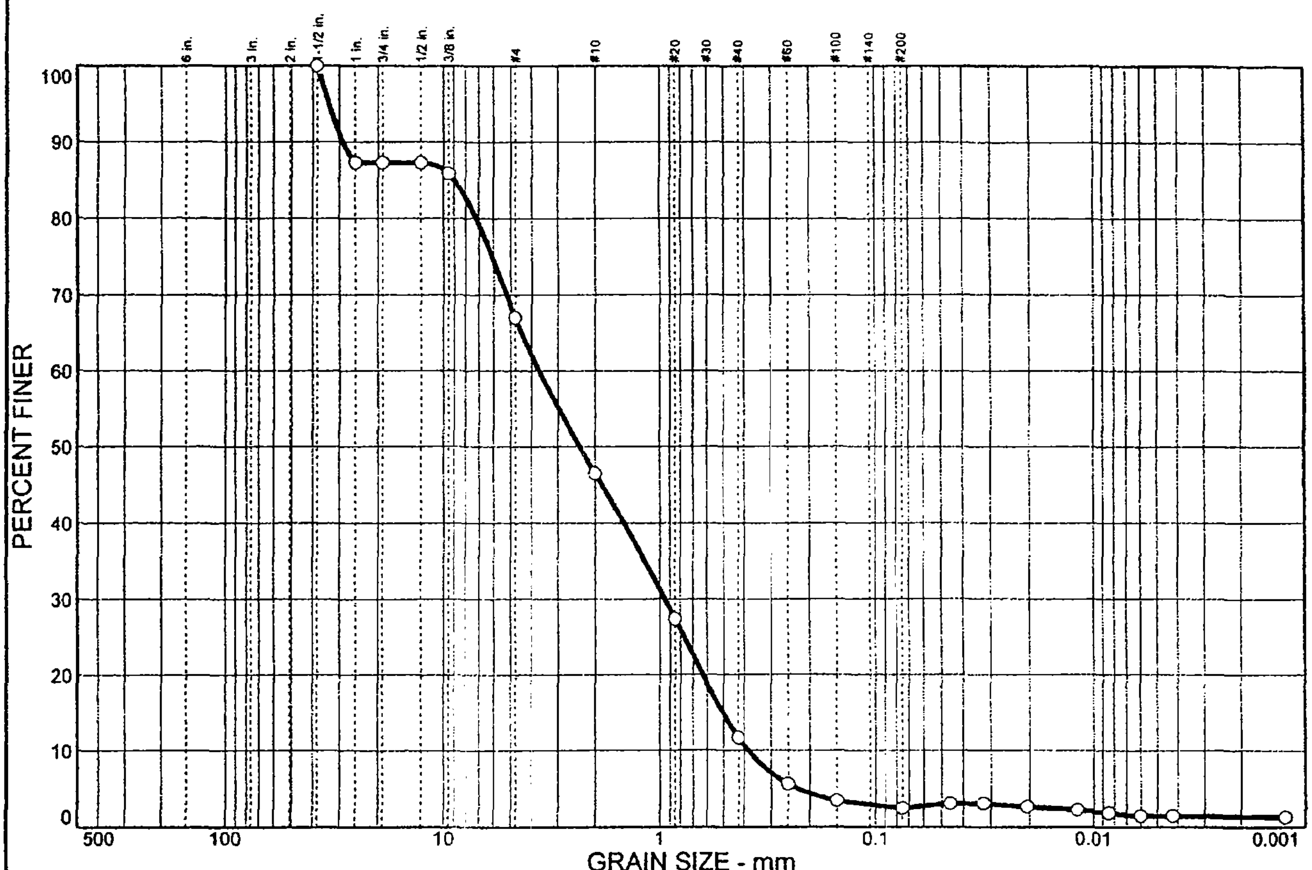
Remarks

Sample No.: CPH-6 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	12.7	20.3	20.5	34.8	9.3	1.0	1.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1.0 in.	87.3		
.75 in.	87.3		
.50 in.	87.3		
.375 in.	85.9		
#4	67.0		
#10	46.5		
#20	27.4		
#40	11.7		
#60	5.6		
#100	3.4		
#200	2.4		

* (no specification provided)

Soil Description

F-C SAND SIZED SLAG SOME F-C GRAVEL SIZES TRACE CLAY SILT SIZES - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 8.95 D_{60}= 3.69 D_{50}= 2.37
D_{30}= 0.947 D_{15}= 0.504 D_{10}= 0.382
C_u= 9.65 C_c= 0.64

Classification

USCS= SP AASHTO=

Remarks

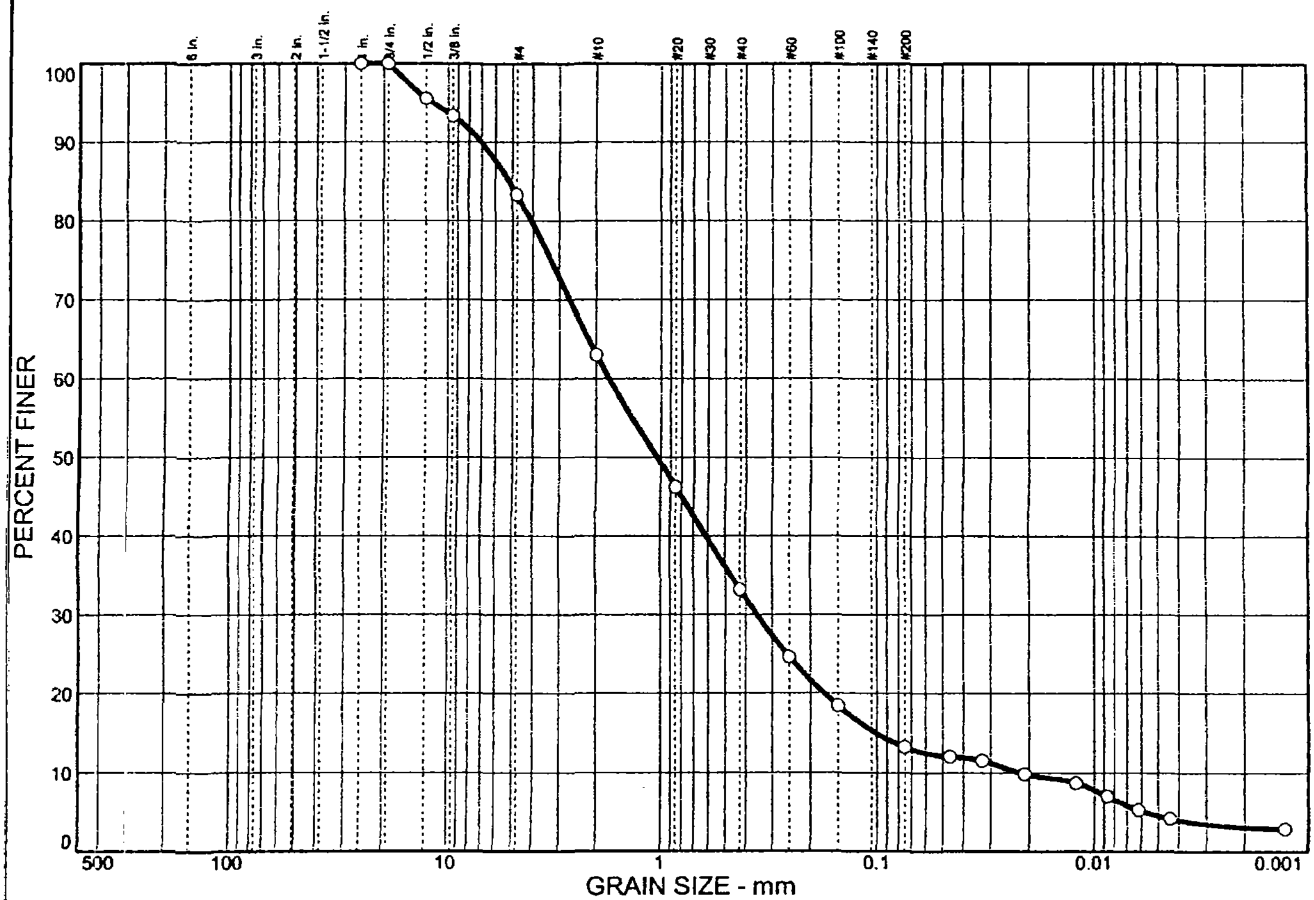
Sample No.: CPH-9 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT

Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	16.7	70.1	8.6	4.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
.75 in.	100.0		
.50 in.	95.5		
.375 in.	93.3		
#4	83.3		
#10	63.0		
#20	46.2		
#40	33.2		
#60	24.6		
#100	18.4		
#200	13.2		

* (no specification provided)

Soil Description

F-C SAND SIZED SLAG LITTLE FINE GRAVEL SIZES TRACE SILT CLAY SIZES - BROWN

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 5.18 D_{60}= 1.74 D_{50}= 1.04
D_{30}= 0.354 D_{15}= 0.102 D_{10}= 0.0223
C_u= 78.30 C_c= 3.22

Classification

USCS= SM AASHTO=

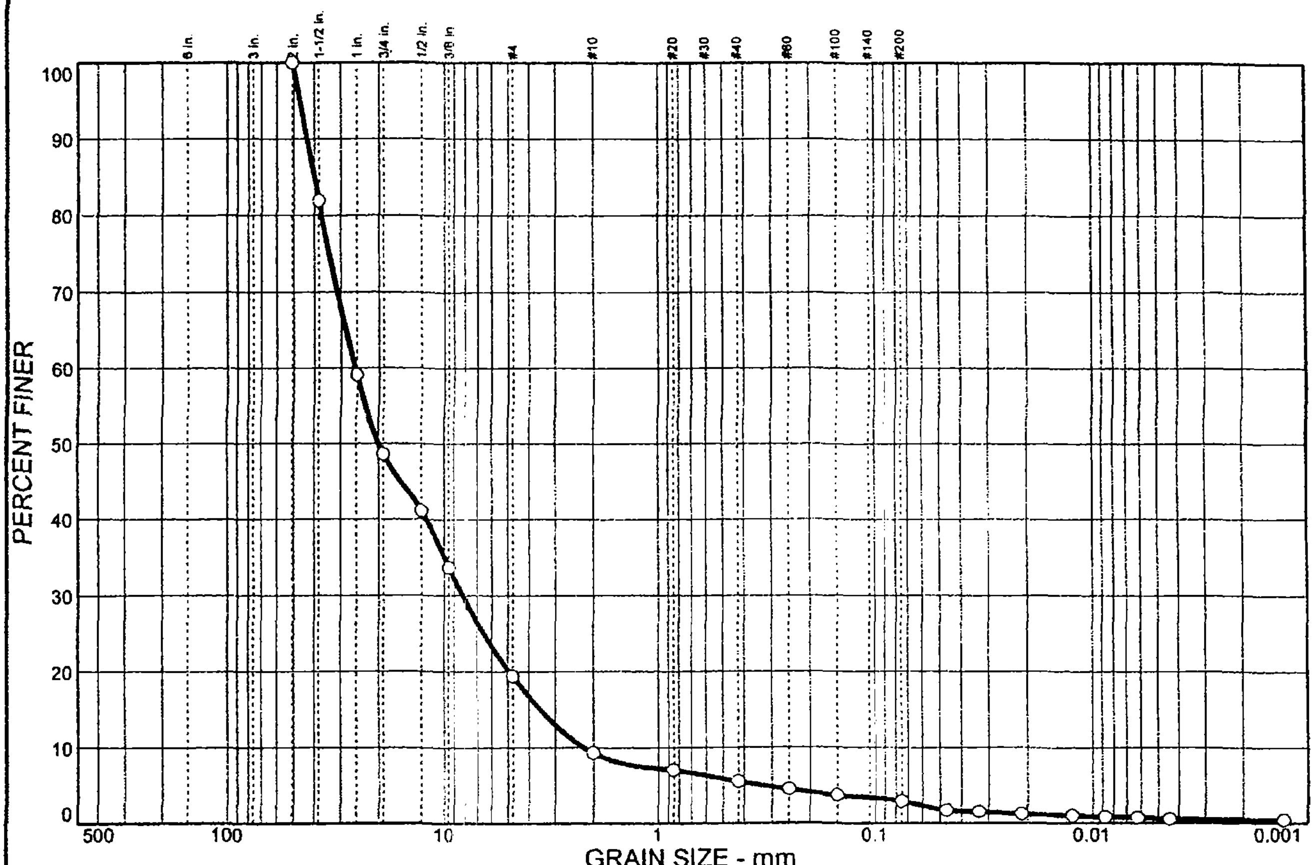
Remarks

Sample No.: MP1-21 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	51.4	29.2	10.1	3.8	2.6	2.3	0.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2.0 in.	100.0		
1.5 in.	81.9		
1.0 in.	59.1		
.75 in.	48.6		
.50 in.	41.1		
.375 in.	33.7		
#4	19.4		
#10	9.3		
#20	7.0		
#40	5.5		
#60	4.5		
#100	3.7		
#200	2.9		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG LITTLE F-C SAND SIZES TRACE SILT SIZES - BROWN & GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 40.0 D_{60}= 25.9 D_{50}= 20.0
D_{30}= 8.21 D_{15}= 3.53 D_{10}= 2.21
C_u= 11.72 C_c= 1.18

Classification

USCS= GW AASHTO=

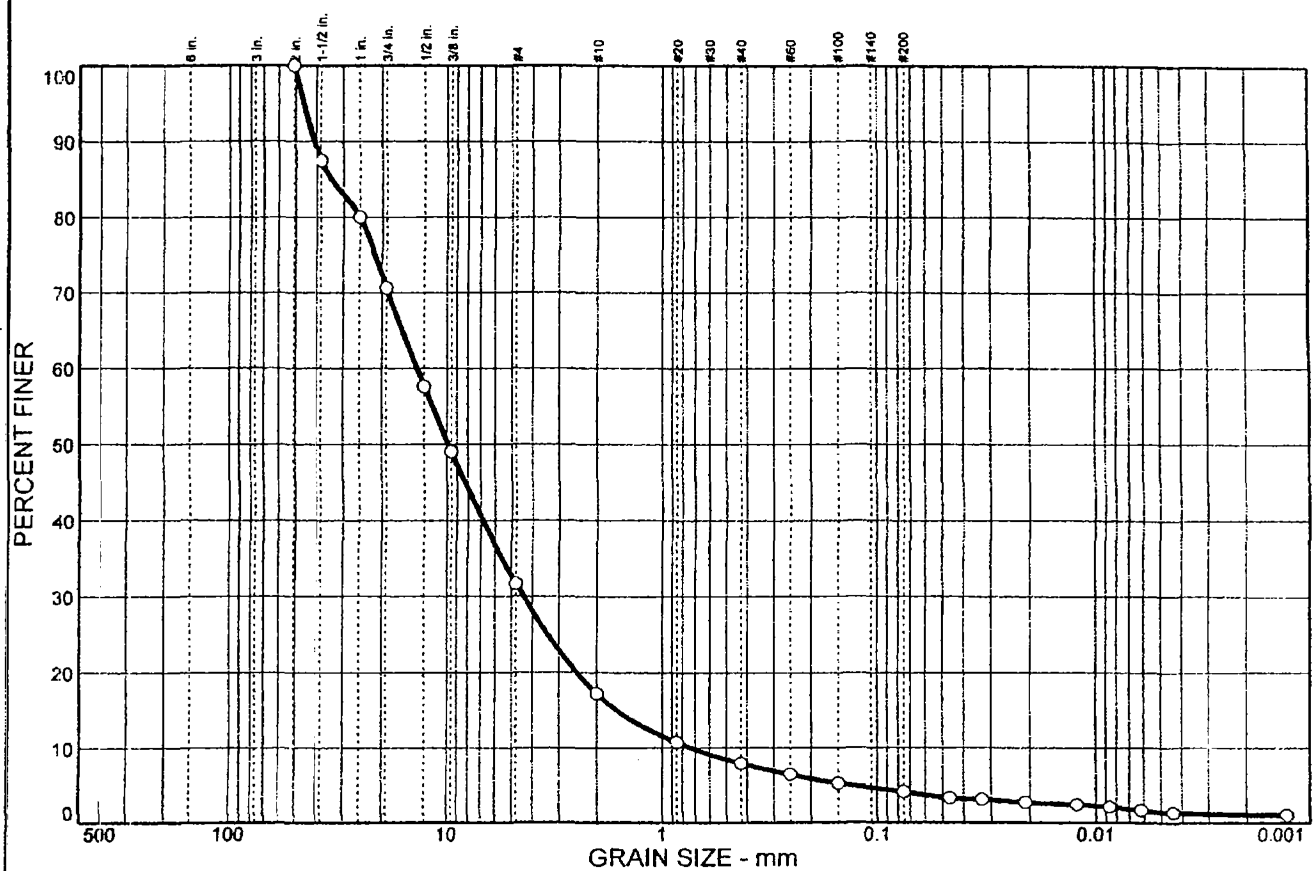
Remarks

Sample No.: NP-13 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	29.4	38.9	14.5	9.3	3.8	2.7	1.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2.0 in.	100.0		
1.5 in.	87.5		
1.0 in.	80.0		
.75 in.	70.6		
.50 in.	57.6		
.375 in.	49.0		
#4	31.7		
#10	17.2		
#20	10.7		
#40	7.9		
#60	6.4		
#100	5.2		
#200	4.1		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG SOME F-C SAND SIZES TRACE SILT CLAY SIZES - BROWN & GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 34.3 D_{60}= 13.7 D_{50}= 9.86
D_{30}= 4.38 D_{15}= 1.62 D_{10}= 0.733
C_u= 18.74 C_c= 1.90

Classification

USCS= GW AASHTO=

Remarks

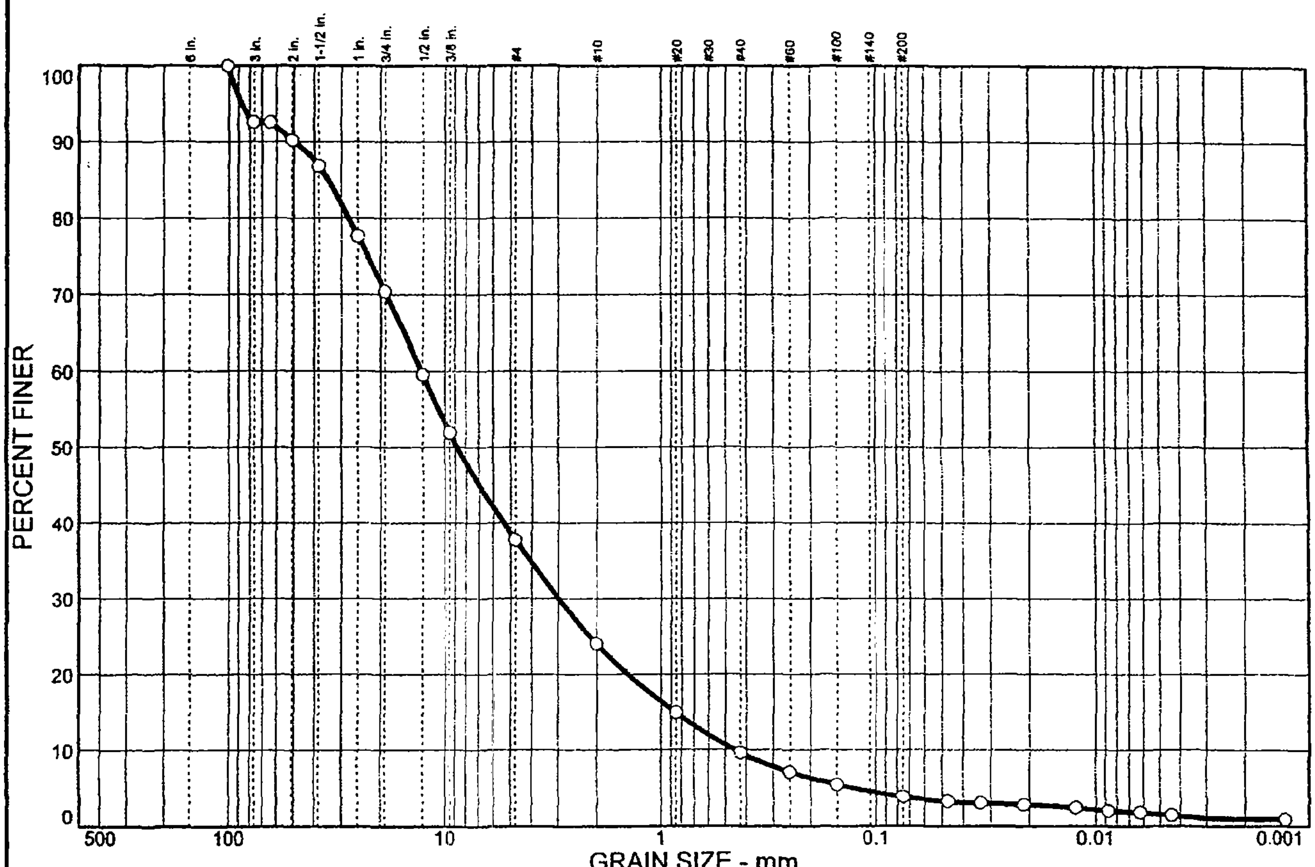
Sample No.: NP-14 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT

Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
7.4	22.2	32.6	13.8	14.4	5.8	2.2	1.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4 in.	100.0		
3 in.	92.6		
2.5 in.	92.6		
2 in.	90.2		
1.5 in.	86.8		
1.0 in.	77.6		
.75 in.	70.4		
.50 in.	59.5		
.375 in.	51.9		
#4	37.8		
#10	24.0		
#20	14.9		
#40	9.6		
#60	7.1		
#100	5.4		
#200	3.8		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG SOME F-C SAND TRACE COBBLES TRACE SILT TRACE CLAY - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 34.6 D_{60}= 12.9 D_{50}= 8.80
D_{30}= 3.00 D_{15}= 0.860 D_{10}= 0.453
C_u= 28.52 C_c= 1.54

Classification

USCS= GW AASHTO=

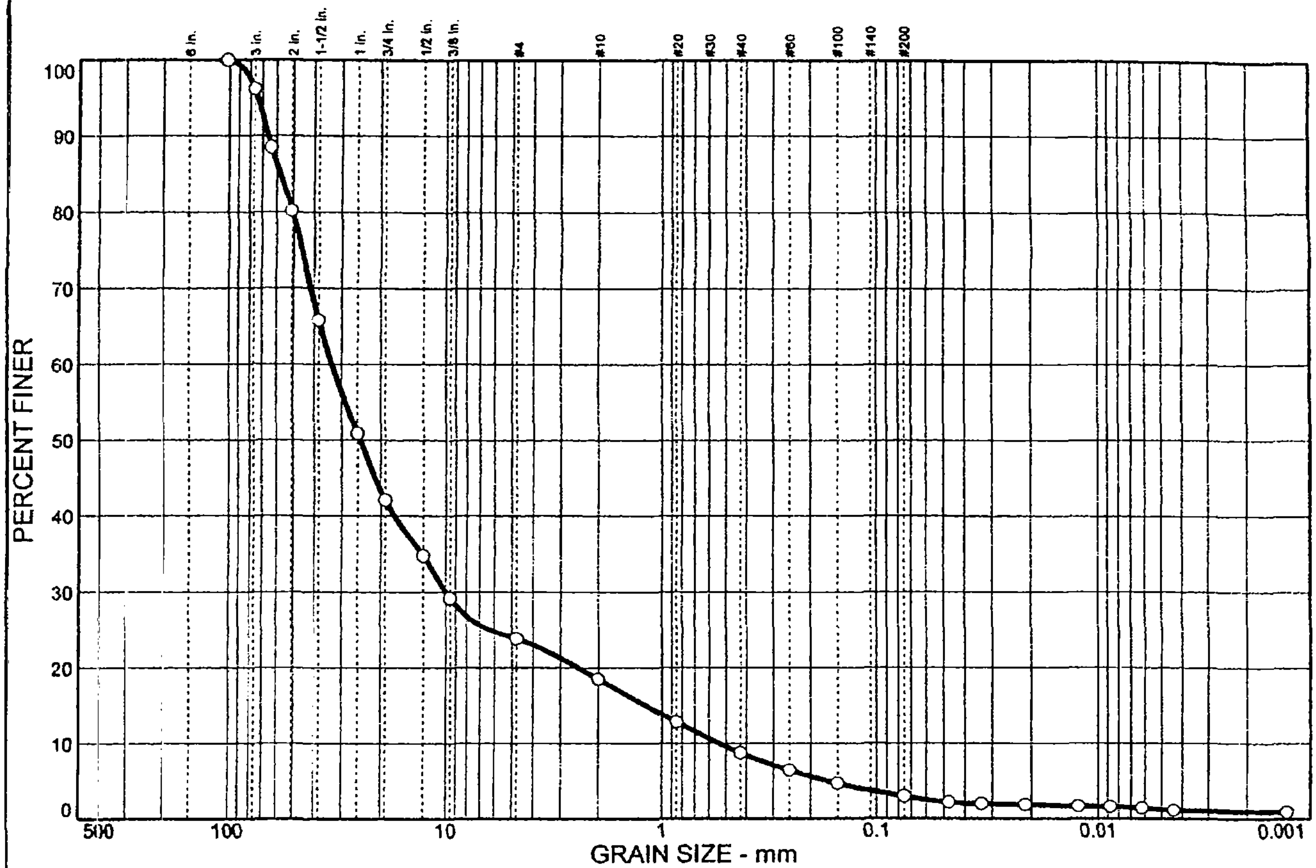
Remarks

Sample No.: NP-15 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
3.8	54.1	18.3	5.3	9.8	5.7	1.8	1.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4 in.	100.0		
3 in.	96.2		
2.5 in.	88.5		
2.0 in.	80.2		
1.5 in.	65.8		
1.0 in.	50.9		
.75 in.	42.1		
.50 in.	34.8		
.375 in.	29.2		
#4	23.8		
#10	18.5		
#20	12.8		
#40	8.7		
#60	6.4		
#100	4.7		
#200	3.0		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG SOME F-C SAND TRACE COBBLE TRACE SILT TRACE CLAY - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 57.8 D_{60}= 33.2 D_{50}= 24.7
D_{30}= 9.96 D_{15}= 1.19 D_{10}= 0.540
C_u= 61.58 C_c= 5.53

Classification

USCS= GP AASHTO=

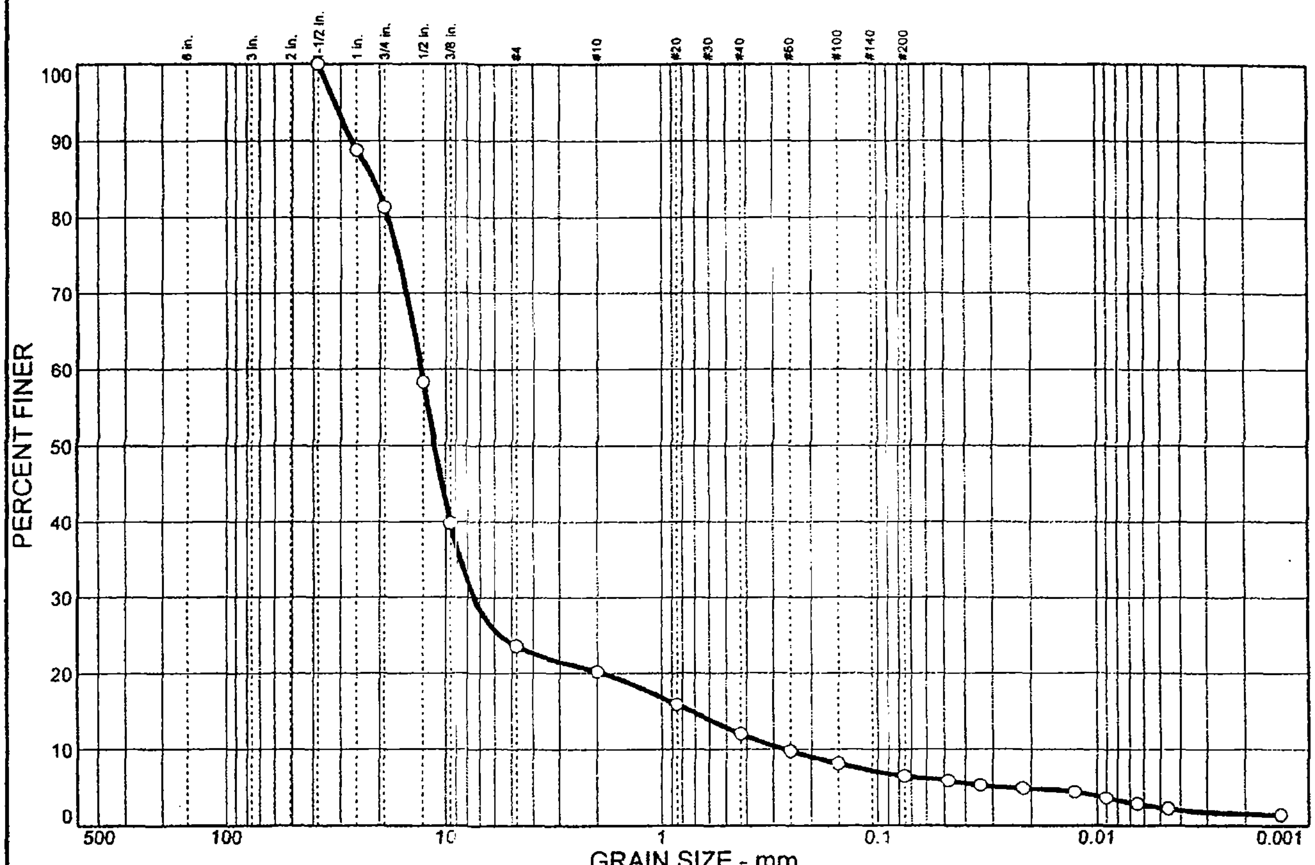
Remarks

Sample No.: NP-16 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	18.7	57.7	3.4	8.2	5.5	4.2	2.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1.0 in.	88.8		
.75 in.	81.3		
.50 in.	58.3		
.375 in.	39.8		
#4	23.6		
#10	20.2		
#20	15.9		
#40	12.0		
#60	9.7		
#100	8.1		
#200	6.5		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG LITTLE F-C SAND SIZES TRACE SILT CLAY SIZES - DK. GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 21.5 D_{60}= 13.0 D_{50}= 11.2
D_{30}= 7.44 D_{15}= 0.729 D_{10}= 0.271
C_u= 48.06 C_c= 15.69

Classification

USCS= GP-GM AASHTO=

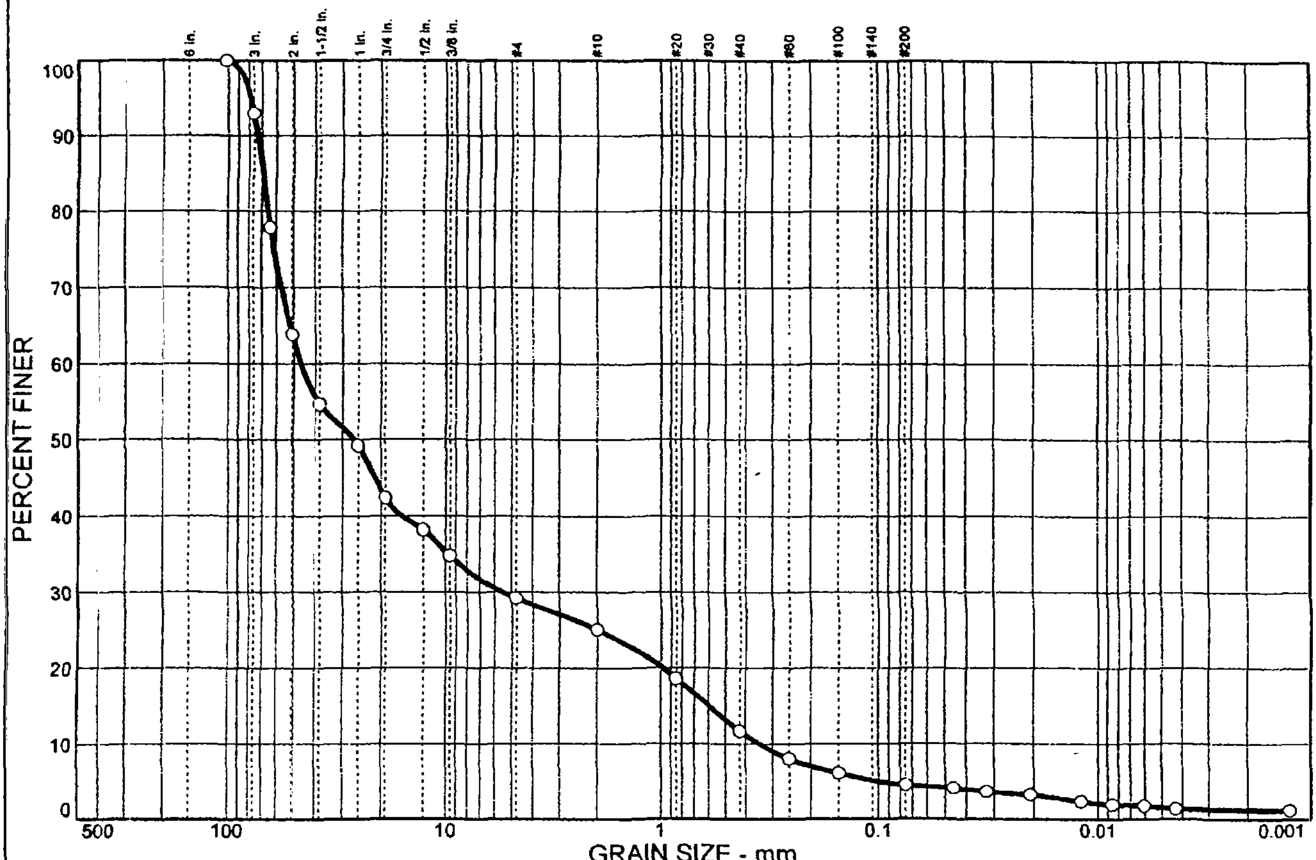
Remarks

Sample No.: RR0-12 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
7.0	50.6	13.2	4.1	13.4	7.2	3.0	1.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4.0 in.	100.0		
3.0 in.	93.0		
2.5 in.	77.8		
2 in.	63.8		
1.5 in.	54.7		
1 in.	49.2		
.75 in.	42.4		
.50 in.	38.2		
.375 in.	34.8		
#4	29.2		
#10	25.1		
#20	18.6		
#40	11.7		
#60	8.0		
#100	6.1		
#200	4.5		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG SOME F-C SAND SIZES TRACE COBBLES TRACE SILT TRACE CLAY - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 68.9 D_{60}= 46.3 D_{50}= 26.6
D_{30}= 5.47 D_{15}= 0.596 D_{10}= 0.345
C_u= 134.34 C_c= 1.87

Classification

USCS= GW AASHTO=

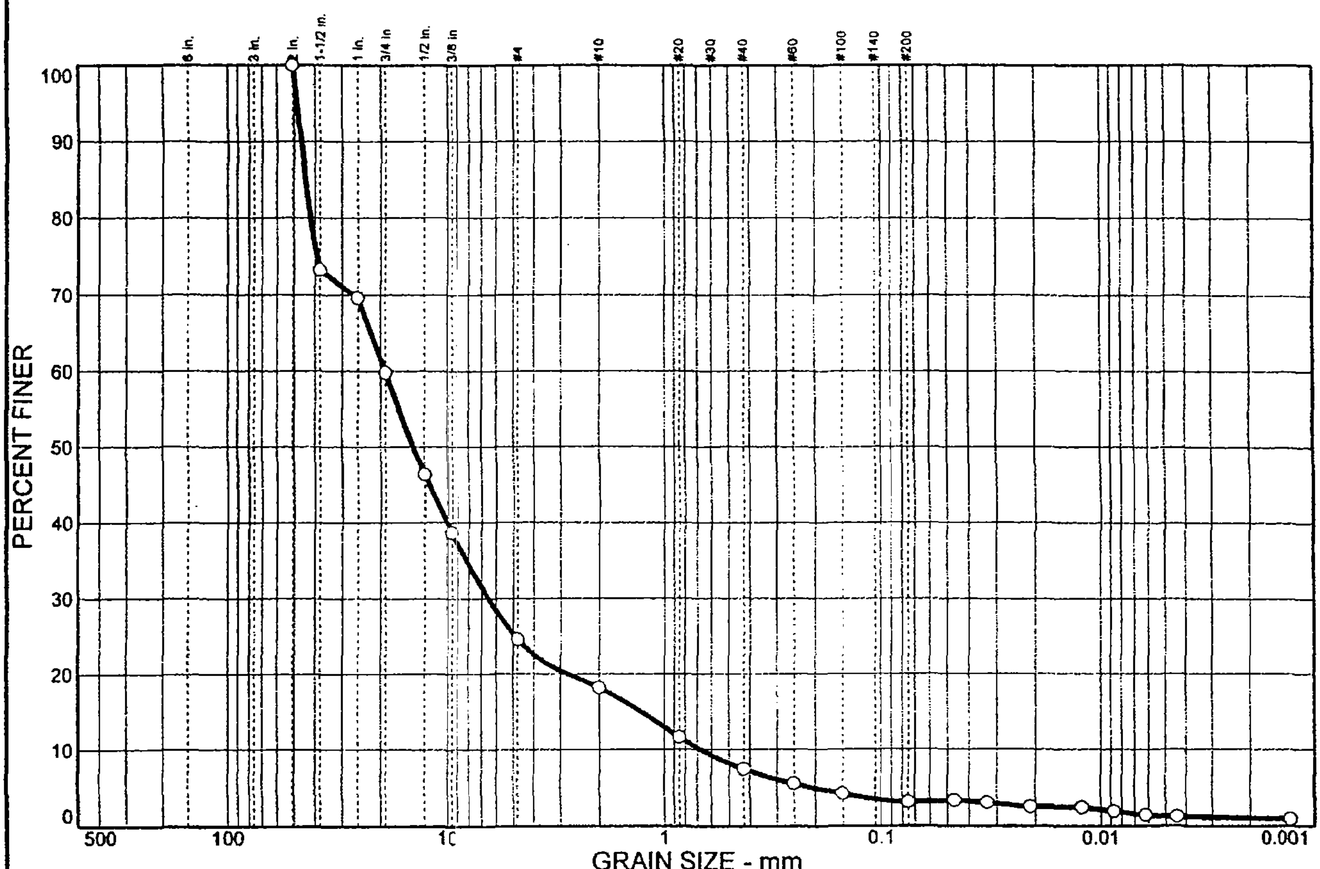
Remarks

Sample No.: RR1-1 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	40.2	35.2	6.4	10.8	4.3	1.9	1.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2 in.	100.0		
1.5 in.	73.2		
1.0 in.	69.6		
.75 in.	59.8		
.50 in.	46.4		
.375 in.	38.7		
#4	24.6		
#10	18.2		
#20	11.6		
#40	7.4		
#60	5.5		
#100	4.2		
#200	3.1		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG SOME F-C SAND TRACE SILT TRACE CLAY - BROWN

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 44.3 D_{60}= 19.2 D_{50}= 14.3
D_{30}= 6.51 D_{15}= 1.29 D_{10}= 0.678
C_u= 28.24 C_c= 3.26

Classification

USCS= GP AASHTO=

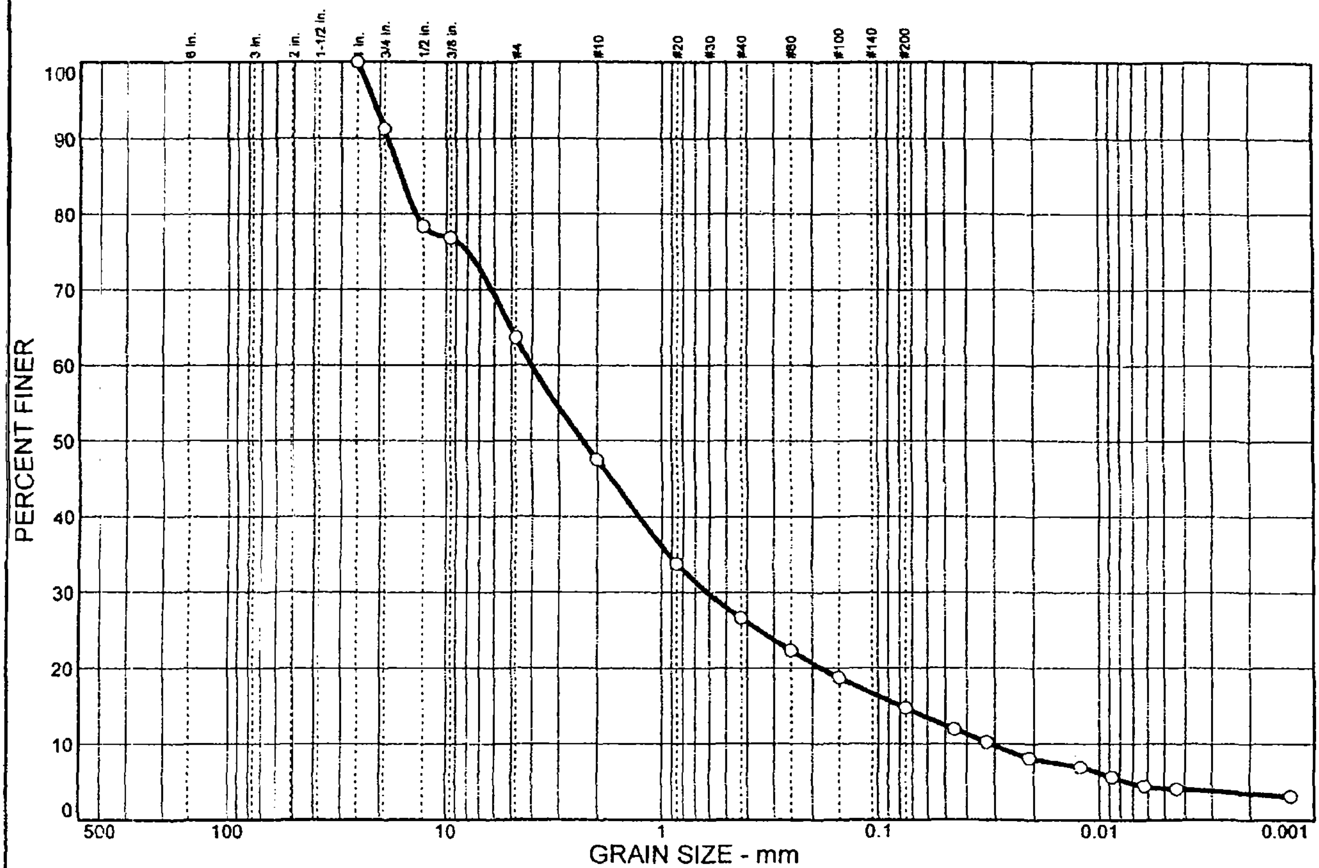
Remarks

Sample No.: RR1-2 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	8.8	27.6	16.1	20.9	11.9	10.6	4.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
.75 in.	91.2		
.50 in.	78.4		
.375 in.	76.9		
#4	63.6		
#10	47.5		
#20	33.8		
#40	26.6		
#60	22.3		
#100	18.7		
#200	14.7		

* (no specification provided)

Soil Description

F-C SAND SIZED AND F-C GRAVEL SIZED SLAG LITTLE SILT TRACE CLAY - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 16.1 D_{60}= 4.03 D_{50}= 2.32
D_{30}= 0.613 D_{15}= 0.0791 D_{10}= 0.0313
C_u= 128.72 C_c= 2.98

Classification

USCS= SM AASHTO=

Remarks

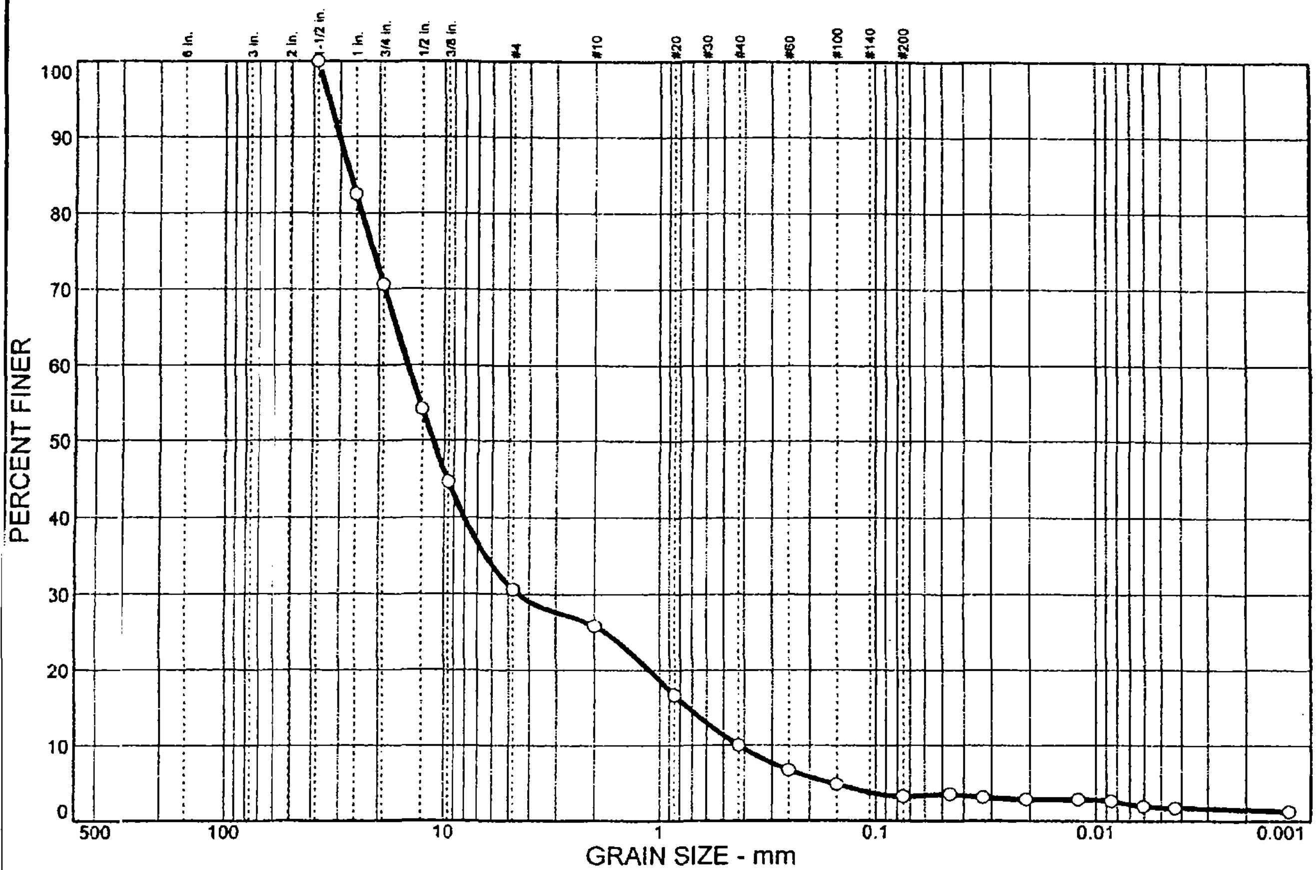
Sample No.: RR1-3 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT

Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	29.4	40.0	4.8	15.8	6.8	1.5	1.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in	100.0		
1.0 in	82.5		
.75 in	70.6		
.50 in	54.2		
.375 in	44.6		
#4	30.6		
#10	25.8		
#20	16.7		
#40	10.0		
#60	6.7		
#100	4.8		
#200	3.2		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG SOME F-C SAND SIZES TRACE SILT TRACE CLAY - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 27.0 D_{60}= 14.7 D_{50}= 11.3
D_{30}= 4.47 D_{15}= 0.730 D_{10}= 0.425
C_u= 34.68 C_c= 3.20

Classification

USCS= GP AASHTO=

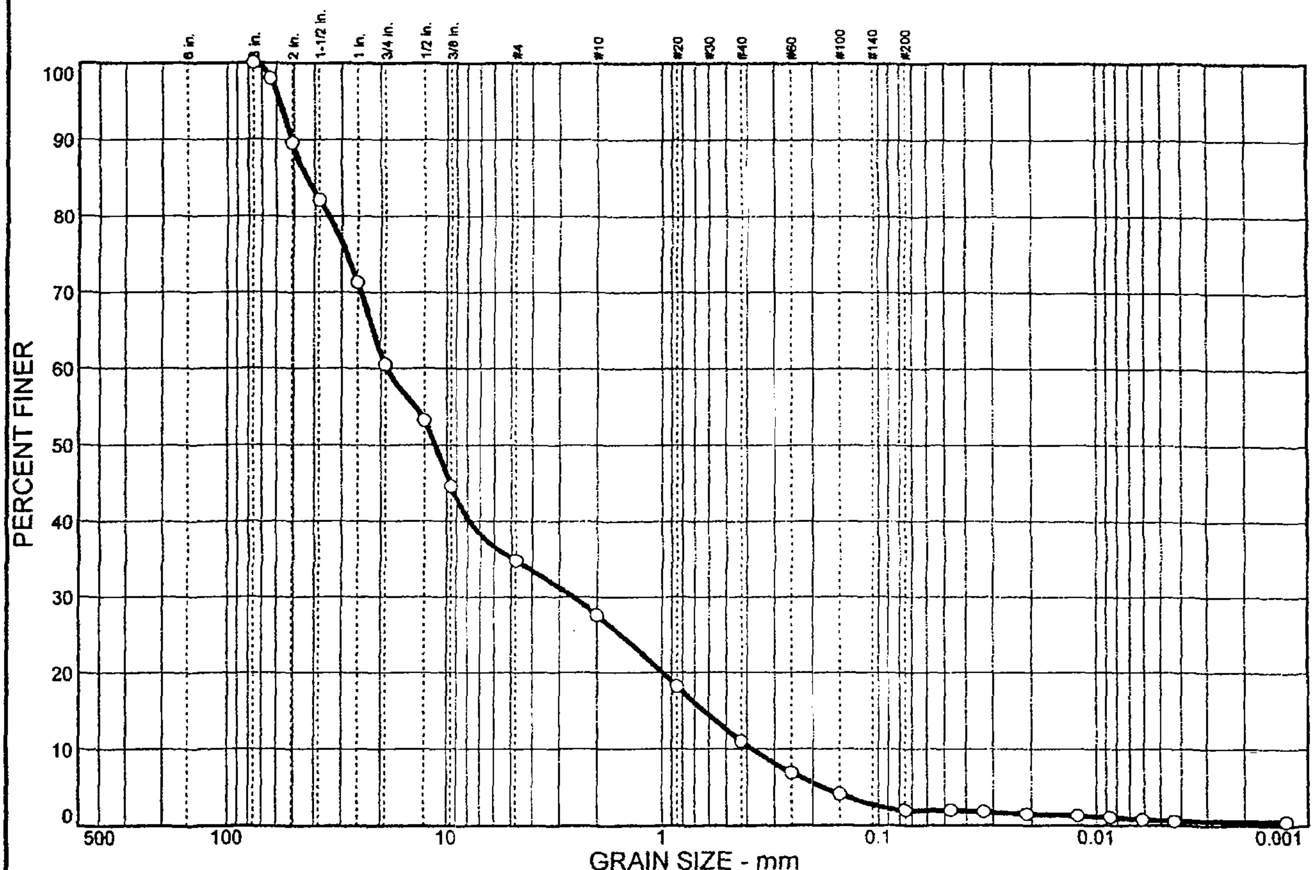
Remarks

Sample No.: RR1-4 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	39.5	25.7	7.2	16.6	9.0	1.3	0.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
2.5 in.	98.0		
2 in.	89.6		
1.5 in.	82.1		
1 in.	71.3		
.75 in.	60.5		
.50 in.	53.2		
.375 in.	44.6		
#4	34.8		
#10	27.6		
#20	18.2		
#40	11.0		
#60	6.9		
#100	4.1		
#200	2.0		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG SOME F-C SAND SIZES TRACE SILT - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 43.5 D_{60}= 18.7 D_{50}= 11.3
D_{30}= 2.59 D_{15}= 0.636 D_{10}= 0.379
C_u= 49.35 C_c= 0.94

Classification

USCS= GP AASHTO=

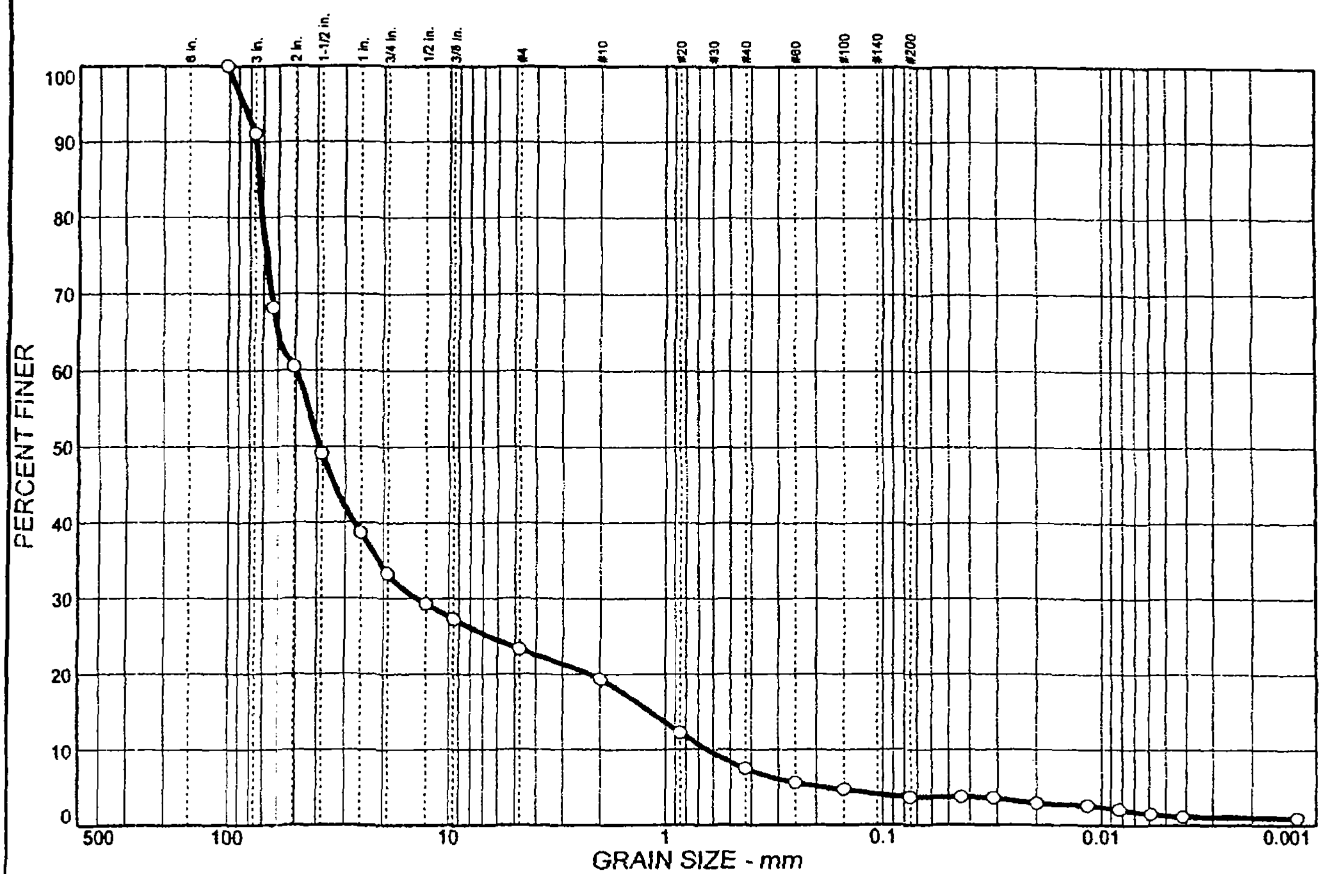
Remarks

Sample No.: RR2-11 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
8.9	57.8	10.0	4.0	11.8	3.8	2.4	1.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4 in.	100.0		
3 in.	91.1		
2.5 in.	68.2		
2 in.	60.5		
1.5 in.	49.1		
1.0 in.	38.7		
.75 in.	33.3		
.50 in.	29.3		
.375 in.	27.3		
#4	23.3		
#10	19.3		
#20	12.2		
#40	7.5		
#60	5.6		
#100	4.7		
#200	3.7		

* (no specification provided)

Soil Description

F-C GRAVEL SIZED SLAG LITTLE F-C SAND TRACE COBBLES TRACE SILT TRACE CLAY - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 73.1 D_{60}= 49.8 D_{50}= 38.9
D_{30}= 14.0 D_{15}= 1.17 D_{10}= 0.640
C_u= 77.79 C_c= 6.13

Classification

USCS= GP AASHTO=

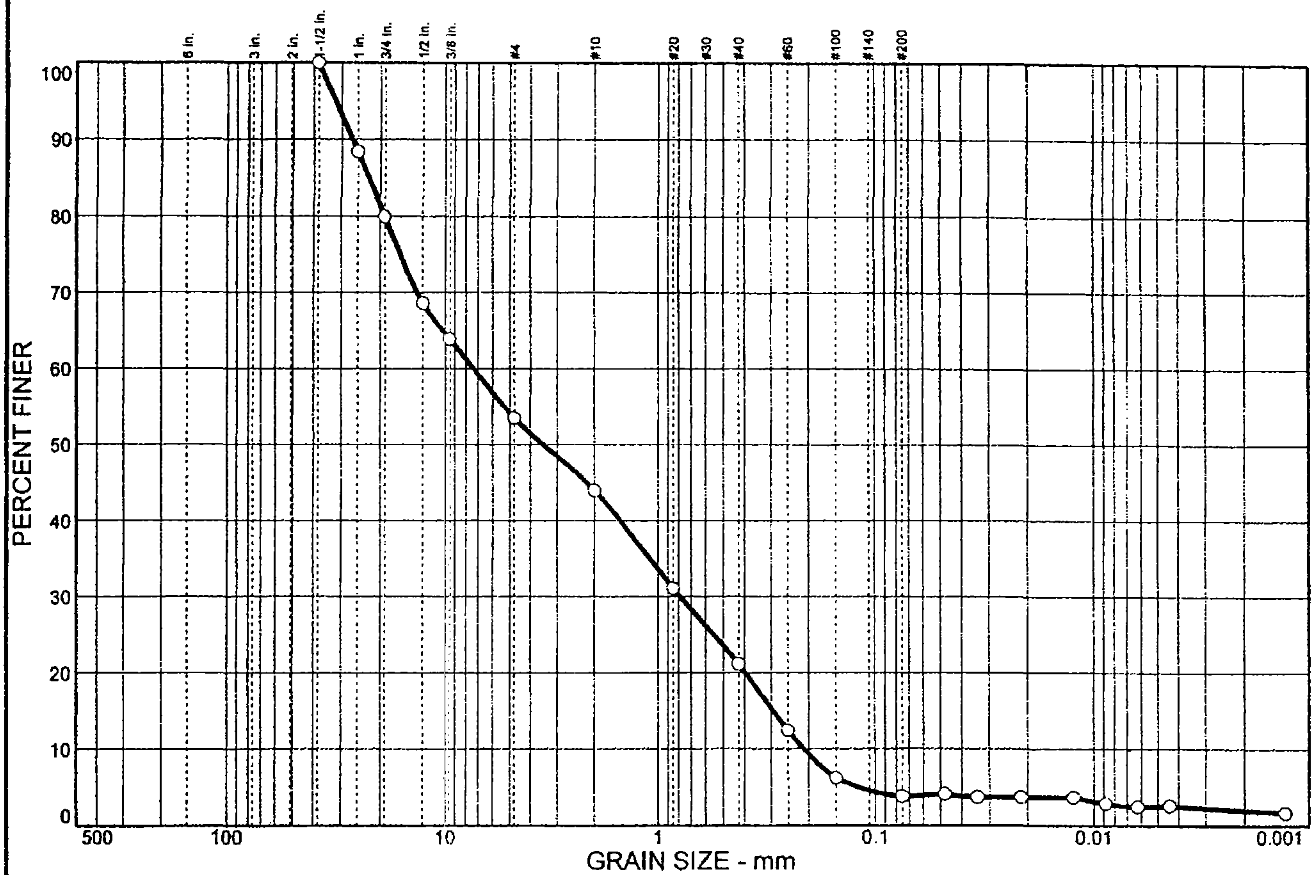
Remarks

Sample No.: RCO-5 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

Particle Size Distribution Report (ASTM D422)



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	20.0	26.5	9.5	22.9	17.3	1.2	2.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1.0 in.	88.4		
.75 in.	80.0		
.50 in.	68.6		
.375 in.	63.9		
#4	53.5		
#10	44.0		
#20	31.1		
#40	21.1		
#60	12.4		
#100	6.2		
#200	3.8		

* (no specification provided)

Soil Description

F-C SAND SIZED SLAG AND F-C GRAVEL SIZES
TRACE SILT CLAY SIZES - GRAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 22.6 D_{60}= 7.37 D_{50}= 3.50
D_{30}= 0.789 D_{15}= 0.294 D_{10}= 0.212
C_u= 34.82 C_c= 0.40

Classification

USCS= SP AASHTO=

Remarks

Sample No.: RCO-10 **Source of Sample:** **Date:** 3/15/05
Location: **Elev./Depth:**

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: ENVIRON INTERNATIONAL CORPORATION
Project: EAGLES ZINC PROJECT
Project No: 34601 **Plate**

EMISSION RATE CALCULATIONS

Pile	Us/Ur	Surface Area (m^2) Weighted Average	30 Microns or less			15 Microns or less			10 Microns or less			2.5 Microns or less		
			Particulate Emissions (g/yr)	Particulate Emissions (g/s)	Emission Rate (g/s-m^2)	Particulate Emissions (g/yr)	Particulate Emissions (g/s)	Emission Rate (g/s-m^2)	Particulate Emissions (g/yr)	Particulate Emissions (g/s)	Emission Rate (g/s-m^2)	Particulate Emissions (g/yr)	Particulate Emissions (g/s)	Emission Rate (g/s-m^2)
RR2-11	0.9	281	5,244	0.00017	5.93E-07	3,147	0.00010	3.56E-07	2,622	0.000083	2.96E-07	1,049	0.000033	1.19E-07
	1.1	67	7,302	0.00023	3.46E-06	4,381	0.00014	2.08E-06	3,651	0.00012	1.73E-06	1,460	0.000046	6.92E-07
	Total	347	12,547	0.00040	**1.15E-06**	7,528	0.00024	6.87E-07	6,273	0.00020	**5.73E-07**	2,509	0.000080	2.29E-07
RCO-10	0.9	91	1,710	0.000054	5.93E-07	1,026	0.000033	3.56E-07	855	0.000027	2.97E-07	342	0.000011	1.19E-07
	1.1	0	0	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA
	Total	91	1,710	0.000054	**5.93E-07**	1,026	0.000033	3.56E-07	855	0.000027	**2.97E-07**	342	0.000011	1.19E-07
RR1-4	Height-to-Base ratio less than 0.2, therefore no subarea configurations. As a result, U* is always less than Ut* and no emissions due to wind erosion occur.													
RR1-3	0.9	102	1,899	0.000060	5.93E-07	1,139	0.000036	3.56E-07	949	0.000030	2.96E-07	380	0.000012	1.19E-07
	1.1	24	2,644	0.000084	3.46E-06	1,586	0.000050	2.08E-06	1,322	0.000042	1.73E-06	529	0.000017	6.92E-07
	Total	126	4,542	0.00014	**1.15E-06**	2,725	0.000086	6.87E-07	2,271	0.000072	**5.73E-07**	908	0.000029	2.29E-07
CPH-9	0.9	36	674	0.000021	5.93E-07	404	0.000013	3.56E-07	337	0.000011	2.97E-07	135	0.0000043	1.19E-07
	1.1	0	0	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA
	Total	36	674	0.000021	**5.93E-07**	404	0.000013	3.56E-07	337	0.000011	**2.97E-07**	135	0.0000043	1.19E-07
CPH-6	0.9	21	389	0.000012	5.93E-07	233	0.000007	3.56E-07	194	0.000006	2.97E-07	78	0.0000025	1.19E-07
	1.1	0	0	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA
	Total	21	389	0.000012	**5.93E-07**	233	0.000007	3.56E-07	194	0.000006	**2.97E-07**	78	0.0000025	1.19E-07
RRO-12	0.9	284	5,304	0.00017	5.93E-07	3,182	0.00010	3.56E-07	2,652	0.000084	2.96E-07	1,061	0.000034	1.19E-07
	1.1	68	7,385	0.00023	3.46E-06	4,431	0.00014	2.08E-06	3,692	0.00012	1.73E-06	1,477	0.000047	6.92E-07
	Total	351	12,688	0.00040	**1.15E-06**	7,613	0.00024	6.87E-07	6,344	0.00020	**5.73E-07**	2,538	0.000080	2.29E-07
NP-15	0.9	66	1,240	0.000039	5.93E-07	744	0.000024	3.56E-07	620	0.000020	2.97E-07	248	0.000008	1.19E-07
	1.1	0	0	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA
	Total	66	1,240	0.000039	**5.93E-07**	744	0.000024	3.56E-07	620	0.000020	**2.97E-07**	248	0.000008	1.19E-07
NP-16	0.9	100	1,863	0.000059	5.93E-07	1,118	0.000035	3.56E-07	931	0.000030	2.97E-07	373	0.000012	1.19E-07
	1.1	0	0	NA	NA	0	NA	NA	0	NA	NA	0	NA	NA
	Total	100	1,863	0.000059	**5.93E-07**	1,118	0.000035	3.56E-07	931	0.000030	**2.97E-07**	373	0.000012	1.19E-07
NP-13	Height-to-Base ratio less than 0.2, therefore no subarea configurations. As a result, U* is always less than Ut* and no emissions due to wind erosion occur.													
NP-14	Height-to-Base ratio less than 0.2, therefore no subarea configurations. As a result, U* is always less than Ut* and no emissions due to wind erosion occur.													
RCO-5	Height-to-Base ratio less than 0.2, therefore no subarea configurations. As a result, U* is always less than Ut* and no emissions due to wind erosion occur.													
MP1-21	Height-to-Base ratio less than 0.2, therefore no subarea configurations. As a result, U* is always less than Ut* and no emissions due to wind erosion occur.													
RR1-2	Height-to-Base ratio less than 0.2, therefore no subarea configurations. As a result, U* is always less than Ut* and no emissions due to wind erosion occur.													
RR1-1	Height-to-Base ratio less than 0.2, therefore no subarea configurations. As a result, U* is always less than Ut* and no emissions due to wind erosion occur.													

SCREEN MODEL OUTPUT FILE - RR2-11

Particle Size (microns)	30	< 15	< 10	< 2.5
Aerodynamic Particle Size Multiplier	1.0	0.6	0.5	0.2

Pile ID	RR2-11	Input
Height (m)	9.15	Input - 30 ft x (1 m / 3.28 ft)
Surface Area (m^2)	1923	Input - 20689 ft^2 x (1 m^2 / 10.7584 ft^2)
Radius (m)	8.37	Calculated using SA = Pi x r x r^2 + h^2
Height to Base Ratio	0.55	Calculated - height/diameter
Pile Area (m2)	220	Calculated Using A = Pi x r^2
Length (m)	20.97	From Map L = 2w, A = wL = $2w^2$
Width (m)	10.49	From Map L = 2w, A = wL = $2w^2$
* Since the height to base ratio is greater than 0.2, the pile significantly penetrates the surface wind layer and must be divided into subareas representing different degrees of exposure to wind.		

Threshold Friction Velocity (m/s), Ut*	1.12	Obtained from AP42 Table 13.2.5-2 for an uncrusted coal pile
Number of Disturbances per year	12	Input - residue piles are inactive, but choose a maintenance disturbance of once per month
Anemometer Height (m)	9.45	Input - surface station Springfield Airport #93822
Typical Roughness Height (m)	0.005	Guidance from AP-42 Chapter 13.2.5 page 6.

		A		B1		B2		B3	
Pile Subarea	**Us/Ur**	**Percent of Pile Surface Area for Pile A**	**Surface Area (m^2)**	**Percent of Pile Surface Area for Pile B2**	**Surface Area (m^2)**	**Percent of Pile Surface Area for Pile B2**	**Surface Area (m^2)**	**Percent of Pile Surface Area for Pile B2**	**Surface Area (m^2)**
0.2a	0.2	5%	96	5%	96	3%	58	3%	58
0.2b	0.2	35%	673	2%	38	28%	538	25%	481
0.2c	0.2	NA	0	29%	558	NA	0	NA	0
0.6a	0.6	48%	923	26%	500	29%	558	28%	538
0.6b	0.6	NA	0	24%	462	22%	423	26%	500
0.9	0.9	12%	231	14%	269	15%	288	14%	269
1.1	1.1	NA	0	NA	0	3%	58	4%	77
			1,923		1,923		1,923		1,923

Fastest Mile U+ Determination Based on 1987 Wind Speed Data from the Springfield, IL Airport (Station ID #93822)

	$U^+_{9.45}$		U^+_{10}		Direction (degrees)		Degrees off center	Pile from AP42 fig 13.2.5-2	Friction Velocity U* (m/s) = 0.10 x (Us/Ur) x U^+_{10}			
Month (1987)	**mph**	**m/s**	**mph**	**m/s**					**Us/Ur = 0.2**	**Us/Ur = 0.6**	**Us/Ur = 0.9**	**Us/Ur = 1.1**
January	25	11.30	25	11.38	200		20	B2	0.23	0.68	1.02	1.25
February (Max Wind Speed)	**32**	**14.40**	**32**	**14.51**	**320**	**MAX**	**40**	**B3**	**0.29**	**0.87**	**1.31**	**1.60**
March	29	12.90	29	13.00	100		10	B2	0.26	0.78	1.17	1.43
April	29	12.90	29	13.00	130		40	B3	0.26	0.78	1.17	1.43
May	31	13.90	31	14.00	200		20	B2	0.28	0.84	1.26	1.54
June	23	10.30	23	10.38	220		40	B3	0.21	0.62	0.93	1.14
July	25	11.30	25	11.38	190		10	B2	0.23	0.68	1.02	1.25
August	24	10.80	24	10.88	200		20	B2	0.22	0.65	0.98	1.20
September	18	8.20	18	8.26	170		10	B2	0.17	0.50	0.74	0.91
October	31	13.90	31	14.00	190		10	B2	0.28	0.84	1.26	1.54
November	28	12.40	28	12.49	180		0	B1	0.25	0.75	1.12	1.37
December	26	11.80	27	11.89	230		40	B3	0.24	0.71	1.07	1.31
Annual Average	27	12.01	27	**12.10**	**194**	**AVE**	**14**	**B2**	**0.24**	**0.73**	**1.09**	**1.33**
*Average wind direction is 14° off center, therefore use Pile B2 from AP42 figure 13.2.5-2												
Friction velocity U* exceeds the threshold friction velocity Ut* of 1.12 m/s for an uncrusted coal pile.												

Us/Ur = 0.9; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Erosion Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	0	B2	288	0	0	0	0
February (Max Wind Speed)	1.31	0.19	6.64	B3	269	1,788	1,073	894	358
March	1.17	0.05	1.39	B2	288	400	240	200	80
April	1.17	0.05	1.39	B3	269	373	224	186	75
May	1.26	0.14	4.65	B2	288	1,342	805	671	268
June	NA	NA	0	B3	269	0	0	0	0
July	NA	NA	0	B2	288	0	0	0	0
August	NA	NA	0	B2	288	0	0	0	0
September	NA	NA	0	B2	288	0	0	0	0
October	1.26	0.14	4.65	B2	288	1,342	805	671	268
November	NA	NA	0	B1	269	0	0	0	0
December	NA	NA	0	B3	269	0	0	0	0
Annual Average	NA	NA	0	B2	288	0	0	0	0
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	5,244	3,147	2,622	1,049

Us/Ur = 1.1; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Emission Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	1.25	0.13	4.32	B2	58	249	150	125	50
February (Max Wind Speed)	1.60	0.48	25.03	B3	77	1,925	1,155	963	385
March	1.43	0.31	13.30	B2	58	767	460	384	153
April	1.43	0.31	13.30	B3	77	1,023	614	512	205
May	1.54	0.42	20.76	B2	58	1,198	719	599	240
June	1.14	0.02	0.56	B3	77	43	26	22	9
July	1.25	0.13	4.32	B2	58	249	150	125	50
August	1.20	0.08	2.27	B2	58	131	78	65	26
September	NA	NA	0	B2	58	0	0	0	0
October	1.54	0.42	20.76	B2	58	1,198	719	599	240
November	1.37	0.25	10.10	B1	0	0	0	0	0
December	1.31	0.19	6.74	B3	77	518	311	259	104
Annual Average	1.33	0.21	7.85	B2	58	453	272	226	91
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	7,302	4,381	3,651	1,460

***Erosion Potential, P (g/m2) = 58(U* - Ut*)2 + 25(U* - Ut*)

SCREEN MODEL OUTPUT FILE - RCO-10

Particle Size (microns)	30	< 15	< 10	< 2.5
Aerodynamic Particle Size Multiplier	1.0	0.6	0.5	0.2

Pile ID	RCO-10	Input
Height (m)	6.10	Input - 30 ft x (1 m / 3.28 ft)
Surface Area (m^2)	761	Input - 20689 ft^2 x (1 m^2 / 10.7584 ft^2)
Radius (m)	6.13	Calculated using SA = Pi x r x r^2 + h^2
Height to Base Ratio	0.50	Calculated - height/diameter
Pile Area (m2)	118	Calculated Using A = Pi x r^2
Length (m)	10.87	From Map L = w, A = wL = w^2
Width (m)	10.87	From Map L = w, A = wL = w^2

* Since the height to base ratio is greater than 0.2, the pile significantly penetrates the surface wind layer and must be divided into subareas representing different degrees of exposure to wind.

Threshold Friction Velocity (m/s), Ut*	1.12	Obtained from AP42 Table 13.2.5-2 for an uncrusted coal pile
Number of Disturbances per year	12	Input - residue piles are inactive, but choose a maintenance disturbance of once per month
Anemometer Height (m)	9.45	Input - surface station Springfield Airport #93822
Typical Roughness Height (m)	0.005	Guidance from AP-42 Chapter 13.2.5 page 6.

		A		B1		B2		B3	
Pile Subarea	Us/Ur	Percent of Pile Surface Area for Pile A	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)
0.2a	0.2	5%	38	5%	38	3%	23	3%	23
0.2b	0.2	35%	267	2%	15	28%	213	25%	190
0.2c	0.2	NA	0	29%	221	NA	0	NA	0
0.6a	0.6	48%	365	26%	198	29%	221	28%	213
0.6b	0.6	NA	0	24%	183	22%	168	26%	198
0.9	0.9	12%	91	14%	107	15%	114	14%	107
1.1	1.1	NA	0	NA	0	3%	23	4%	30
			761		761		761		761

Fastest Mile U+ Determination Based on 1987 Wind Speed Data from the Springfield, IL Airport (Station ID #93822)

	$U^+_{9.45}$		U^+_{10}		Direction (degrees)		Degrees off center	Pile from AP42 fig 13.2.5-2	Friction Velocity U* (m/s) = 0.10 x (Us/Ur) x U^+_{10}			
Month (1987)	mph	m/s	mph	m/s					Us/Ur = 0.2	Us/Ur = 0.6	Us/Ur = 0.9	Us/Ur = 1.1
January	25	11.30	25	11.38	200		NA	A	0.23	0.68	1.02	1.25
February (Max Wind Speed)	32	14.40	32	14.51	320	MAX	NA	A	0.29	0.87	1.31	1.60
March	29	12.90	29	13.00	100		NA	A	0.26	0.78	1.17	1.43
April	29	12.90	29	13.00	130		NA	A	0.26	0.78	1.17	1.43
May	31	13.90	31	14.00	200		NA	A	0.28	0.84	1.26	1.54
June	23	10.30	23	10.38	220		NA	A	0.21	0.62	0.93	1.14
July	25	11.30	25	11.38	190		NA	A	0.23	0.68	1.02	1.25
August	24	10.80	24	10.88	200		NA	A	0.22	0.65	0.98	1.20
September	18	8.20	18	8.26	170		NA	A	0.17	0.50	0.74	0.91
October	31	13.90	31	14.00	190		NA	A	0.28	0.84	1.26	1.54
November	28	12.40	28	12.49	180		NA	A	0.25	0.75	1.12	1.37
December	26	11.80	27	11.89	230		NA	A	0.24	0.71	1.07	1.31
Annual Average	27	12.01	27	12.10	194	AVE	NA	A	0.24	0.73	1.09	1.33

*Wind direction is irrelevant because the pile is circular, therefore use Pile A from AP42 figure 13.2.5-2

Friction velocity U exceeds the threshold friction velocity Ut* of 1.12 m/s for an uncrusted coal pile.*

Us/Ur = 0.9; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Erosion Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	0	A	91	0	0	0	0
February (Max Wind Speed)	1.31	0.19	6.64	A	91	607	364	303	121
March	1.17	0.05	1.39	A	91	127	76	63	25
April	1.17	0.05	1.39	A	91	127	76	63	25
May	1.26	0.14	4.65	A	91	425	255	213	85
June	NA	NA	0	A	91	0	0	0	0
July	NA	NA	0	A	91	0	0	0	0
August	NA	NA	0	A	91	0	0	0	0
September	NA	NA	0	A	91	0	0	0	0
October	1.26	0.14	4.65	A	91	425	255	213	85
November	NA	NA	0	A	91	0	0	0	0
December	NA	NA	0	A	91	0	0	0	0
Annual Average	NA	NA	0	A	91	0	0	0	0
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	1,710	1,026	855	342

Us/Ur = 1.1; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Emission Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	1.25	0.13	4.32	A	0	0	0	0	0
February (Max Wind Speed)	1.60	0.48	25.03	A	0	0	0	0	0
March	1.43	0.31	13.30	A	0	0	0	0	0
April	1.43	0.31	13.30	A	0	0	0	0	0
May	1.54	0.42	20.76	A	0	0	0	0	0
June	1.14	0.02	0.56	A	0	0	0	0	0
July	1.25	0.13	4.32	A	0	0	0	0	0
August	1.20	0.08	2.27	A	0	0	0	0	0
September	NA	NA	0	A	0	0	0	0	0
October	1.54	0.42	20.76	A	0	0	0	0	0
November	1.37	0.25	10.10	A	0	0	0	0	0
December	1.31	0.19	6.74	A	0	0	0	0	0
Annual Average	1.33	0.21	7.85	A	0	0	0	0	0
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	0	0	0	0

***Erosion Potential, P (g/m2) = 58(U* - Ut*)2 + 25(U* - Ut*)

SCREEN MODEL OUTPUT FILE - RR1-4

Particle Size (microns)	30	< 15	< 10	< 2.5
Aerodynamic Particle Size Multiplier	1.0	0.6	0.5	0.2

Pile ID	RR1-4	Input
Height (m)	1.83	Input - 30 ft x (1 m / 3.28 ft)
Surface Area (m^2)	1,132	*Input - 20689* ft^2 *x (1* m^2 */ 10.7584* ft^2*)*
Radius (m)	7.11	Calculated using SA = Pi x r x $r^2 + h^2$
Height to Base Ratio	0.13	Calculated - height/diameter
Pile Area (m2)	159	Calculated Using A = Pi x r^2
Length (m)	17.82	From Map L = 2w, A = wL = $2w^2$
Width (m)	8.91	From Map L = 2w, A = wL = $2w^2$

* Since the height to base ratio is less than 0.2, the pile does not significantly penetrate the surface wind layer. Therefore, no sub-areas needed, and U* = 0.053 x U^+_{10}

Threshold Friction Velocity (m/s), Ut*	1.12	Obtained from AP42 Table 13.2.5-2 for an uncrusted coal pile
Number of Disturbances per year	12	Input - residue piles are inactive, but choose a maintenance disturbance of once per month
Anemometer Height (m)	9.45	Input - surface station Springfield Airport #93822
Typical Roughness Height (m)	0.005	Guidance from AP-42 Chapter 13.2.5 page 6.

		A		B1		B2		B3	
Pile Subarea	Us/Ur	Percent of Pile Surface Area for Pile A	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)
0.2a	0.2	5%	57	5%	57	3%	34	3%	34
0.2b	0.2	35%	396	2%	23	28%	317	25%	283
0.2c	0.2	NA	0	29%	328	NA	0	NA	0
0.6a	0.6	48%	544	26%	294	29%	328	28%	317
0.6b	0.6	NA	0	24%	272	22%	249	26%	294
0.9	0.9	12%	136	14%	159	15%	170	14%	159
1.1	1.1	NA	0	NA	0	3%	34	4%	45
			1,132		1,132		1,132		1,132

Fastest Mile U+ Determination Based on 1987 Wind Speed Data from the Springfield, IL Airport (Station ID #93822)

	$U^+_{9.45}$		U^+_{10}						Friction Velocity U* (m/s) = 0.053 x U^+_{10}			
Month (1987)	mph	m/s	mph	m/s	Direction (degrees)		Degrees off center	Pile from AP42 fig 13.2.5-2	Us/Ur = NA	Us/Ur = NA	Us/Ur = NA	Us/Ur = NA
January	25	11.30	25	11.38	200		NA	NA	NA	NA	NA	0.60
February (Max Wind Speed)	**32**	**14.40**	**32**	**14.51**	**320**	**MAX**	**NA**	**NA**	**NA**	**NA**	**NA**	0.77
March	29	12.90	29	13.00	100		NA	NA	NA	NA	NA	0.69
April	29	12.90	29	13.00	130		NA	NA	NA	NA	NA	0.69
May	31	13.90	31	14.00	200		NA	NA	NA	NA	NA	0.74
June	23	10.30	23	10.38	220		NA	NA	NA	NA	NA	0.55
July	25	11.30	25	11.38	190		NA	NA	NA	NA	NA	0.60
August	24	10.80	24	10.88	200		NA	NA	NA	NA	NA	0.58
September	18	8.20	18	8.26	170		NA	NA	NA	NA	NA	0.44
October	31	13.90	31	14.00	190		NA	NA	NA	NA	NA	0.74
November	28	12.40	28	12.49	180		NA	NA	NA	NA	NA	0.66
December	26	11.80	27	11.89	230		NA	NA	NA	NA	NA	0.63
Annual Average	27	12.01	27	**12.10**	**194**	**AVE**	**NA**	**NA**	**NA**	**NA**	**NA**	0.64

*Sub-areas not required; height to base ratio less than 0.2 and therefore little to no penetration into the surface wind layer.

Friction velocity U* exceeds the threshold friction velocity Ut* of 1.12 m/s for an uncrusted coal pile.

Us/Ur = 0.9; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Erosion Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	NA	NA	NA	NA	NA	NA	NA
February (Max Wind Speed)	NA	NA	NA	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA	NA	NA	NA
June	NA	NA	NA	NA	NA	NA	NA	NA	NA
July	NA	NA	NA	NA	NA	NA	NA	NA	NA
August	NA	NA	NA	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA	NA	NA	NA
November	NA	NA	NA	NA	NA	NA	NA	NA	NA
December	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual Average	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	NA	NA	NA	NA

Us/Ur = 1.1; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Emission Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	NA	NA	NA	NA	NA	NA	NA
February (Max Wind Speed)	NA	NA	NA	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA	NA	NA	NA
June	NA	NA	NA	NA	NA	NA	NA	NA	NA
July	NA	NA	NA	NA	NA	NA	NA	NA	NA
August	NA	NA	NA	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA	NA	NA	NA
November	NA	NA	NA	NA	NA	NA	NA	NA	NA
December	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual Average	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	NA	NA	NA	NA

***Erosion Potential, P (g/m2) = 58(U* - Ut*)2 + 25(U* - Ut*)

SCREEN MODEL OUTPUT FILE - RR1-3

Particle Size (microns)	30	< 15	< 10	< 2.5
Aerodynamic Particle Size Multiplier	1.0	0.6	0.5	0.2

Pile ID	RR1-3	Input
Height (m)	2.44	Input - 30 ft x (1 m / 3.28 ft)
Surface Area (m^2)	696	Input - 20689 ft^2 x (1 m^2 / 10.7584 ft^2)
Radius (m)	6.03	Calculated using SA = Pi x r x r^2 + h^2
Height to Base Ratio	0.20	Calculated - height/diameter
Pile Area (m2)	114	Calculated Using A = Pi x r^2
Length (m)	18.52	From Map L = 3w, A = wL = $3w^2$
Width (m)	6.17	From Map L = 3w, A = wL = $3w^2$

* Since the height to base ratio is greater than 0.2, the pile significantly penetrates the surface wind layer and must be divided into subareas representing different degrees of exposure to wind.

Threshold Friction Velocity (m/s), Ut*	1.12	Obtained from AP42 Table 13.2.5-2 for an uncrusted coal pile
Number of Disturbances per year	12	Input - residue piles are inactive, but choose a maintenance disturbance of once per month
Anemometer Height (m)	9.45	Input - surface station Springfield Airport #93822
Typical Roughness Height (m)	0.005	Guidance from AP-42 Chapter 13.2.5 page 6.

Pile Subarea	Us/Ur	A		B1		B2		B3	
		Percent of Pile Surface Area for Pile A	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)
0.2a	0.2	5%	35	5%	35	3%	21	3%	21
0.2b	0.2	35%	244	2%	14	28%	195	25%	174
0.2c	0.2	NA	0	29%	202	NA	0	NA	0
0.6a	0.6	48%	334	26%	181	29%	202	28%	195
0.6b	0.6	NA	0	24%	167	22%	153	26%	181
0.9	0.9	12%	84	14%	97	15%	104	14%	97
1.1	1.1	NA	0	NA	0	3%	21	4%	28
			696		696		696		696

Fastest Mile U+ Determination Based on 1987 Wind Speed Data from the Springfield, IL Airport (Station ID #93822)

Month (1987)	$U^+_{9.45}$ mph	$U^+_{9.45}$ m/s	U^+_{10} mph	U^+_{10} m/s	Direction (degrees)		Degrees off center	Pile from AP42 fig 13.2.5-2	Friction Velocity U* (m/s) = 0.10 x (Us/Ur) x U^+_{10}: Us/Ur = 0.2	Us/Ur = 0.6	Us/Ur = 0.9	Us/Ur = 1.1
January	25	11.30	25	11.38	200		20	B2	0.23	0.68	1.02	1.25
February (Max Wind Speed)	**32**	**14.40**	**32**	**14.51**	**320**	**MAX**	**40**	**B3**	**0.29**	**0.87**	**1.31**	**1.60**
March	29	12.90	29	13.00	100		10	B2	0.26	0.78	1.17	1.43
April	29	12.90	29	13.00	130		40	B3	0.26	0.78	1.17	1.43
May	31	13.90	31	14.00	200		20	B2	0.28	0.84	1.26	1.54
June	23	10.30	23	10.38	220		40	B3	0.21	0.62	0.93	1.14
July	**25**	**11.30**	**25**	**11.38**	**190**		**10**	**B2**	**0.23**	**0.68**	**1.02**	**1.25**
August	24	10.80	24	10.88	200		20	B2	0.22	0.65	0.98	1.20
September	18	8.20	18	8.26	170		10	B2	0.17	0.50	0.74	0.91
October	31	13.90	31	14.00	190		10	B2	0.28	0.84	1.26	1.54
November	28	12.40	28	12.49	180		0	B1	0.25	0.75	1.12	1.37
December	26	11.80	27	11.89	230		40	B3	0.24	0.71	1.07	1.31
Annual Average	27	12.01	27	**12.10**	**194**	**AVE**	**14**	**B2**	**0.24**	**0.73**	**1.09**	**1.33**

*Average wind direction is 14° off center, therefore use Pile B2 from AP42 figure 13.2.5-2

Friction velocity U* exceeds the threshold friction velocity Ut* of 1.12 m/s for an uncrusted coal pile.

Us/Ur = 0.9; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Erosion Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	0	B2	104	0	0	0	0
February (Max Wind Speed)	1.31	0.19	6.64	B3	97	647	388	324	129
March	1.17	0.05	1.39	B2	104	145	87	72	29
April	1.17	0.05	1.39	B3	97	135	81	68	27
May	1.26	0.14	4.65	B2	104	486	291	243	97
June	NA	NA	0	B3	97	0	0	0	0
July	NA	NA	0	B2	104	0	0	0	0
August	NA	NA	0	B2	104	0	0	0	0
September	NA	NA	0	B2	104	0	0	0	0
October	1.26	0.14	4.65	B2	104	486	291	243	97
November	NA	NA	0	B1	97	0	0	0	0
December	NA	NA	0	B3	97	0	0	0	0
Annual Average	NA	NA	0	B2	104	0	0	0	0
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	1,899	1,139	949	380

Us/Ur = 1.1; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Emission Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	1.25	0.13	4.32	B2	21	90	54	45	18
February (Max Wind Speed)	1.60	0.48	25.03	B3	28	697	418	349	139
March	1.43	0.31	13.30	B2	21	278	167	139	56
April	1.43	0.31	13.30	B3	28	370	222	185	74
May	1.54	0.42	20.76	B2	21	434	260	217	87
June	1.14	0.02	0.56	B3	28	16	9	8	3
July	1.25	0.13	4.32	B2	21	90	54	45	18
August	1.20	0.08	2.27	B2	21	47	28	24	9
September	NA	NA	0	B2	21	0	0	0	0
October	1.54	0.42	20.76	B2	21	434	260	217	87
November	1.37	0.25	10.10	B1	0	0	0	0	0
December	1.31	0.19	6.74	B3	28	188	113	94	38
Annual Average	1.33	0.21	7.85	B2	21	164	98	82	33
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	2,644	1,586	1,322	529

***Erosion Potential, P (g/m2) = 58(U* - Ut*)2 + 25(U* - Ut*)

SCREEN MODEL OUTPUT FILE - CPH-9

Particle Size (microns)	30	< 15	< 10	< 2.5
Aerodynamic Particle Size Multiplier	1.0	0.6	0.5	0.2

Pile ID	CPH-9	Input
Height (m)	5.49	Input - 30 ft x (1 m / 3.28 ft)
Surface Area (m^2)	300	Input - 20689 ft^2 x (1 m^2 / 10.7584 ft^2)
Radius (m)	4.41	Calculated using SA = Pi x r x r^2 + h^2
Height to Base Ratio	0.62	Calculated - height/diameter
Pile Area (m2)	61	Calculated Using A = Pi x r^2
Length (m)	7.82	From Map L = w, A = wL = w^2
Width (m)	7.82	From Map L = w, A = wL = w^2
* Since the height to base ratio is greater than 0.2, the pile significantly penetrates the surface wind layer and must be divided into subareas representing different degrees of exposure to wind.		

Threshold Friction Velocity (m/s), Ut*	1.12	Obtained from AP42 Table 13.2.5-2 for an uncrusted coal pile
Number of Disturbances per year	12	Input - residue piles are inactive, but choose a maintenance disturbance of once per month
Anemometer Height (m)	9.45	Input - surface station Springfield Airport #93822
Typical Roughness Height (m)	0.005	Guidance from AP-42 Chapter 13.2.5 page 6.

		A		B1		B2		B3	
Pile Subarea	**Us/Ur**	**Percent of Pile Surface Area for Pile A**	**Surface Area (m^2)**	**Percent of Pile Surface Area for Pile B2**	**Surface Area (m^2)**	**Percent of Pile Surface Area for Pile B2**	**Surface Area (m^2)**	**Percent of Pile Surface Area for Pile B2**	**Surface Area (m^2)**
0.2a	0.2	5%	15	5%	15	3%	9	3%	9
0.2b	0.2	35%	105	2%	6	28%	84	25%	75
0.2c	0.2	NA	0	29%	87	NA	0	NA	0
0.6a	0.6	48%	144	26%	78	29%	87	28%	84
0.6b	0.6	NA	0	24%	72	22%	66	26%	78
0.9	0.9	12%	36	14%	42	15%	45	14%	42
1.1	1.1	NA	0	NA	0	3%	9	4%	12
			300		300		300		300

Fastest Mile U+ Determination Based on 1987 Wind Speed Data from the Springfield, IL Airport (Station ID #93822)												
	$U^+_{9.45}$		**U^+_{10}**		**Direction (degrees)**		**Degrees off center**	**Pile from AP42 fig 13.2.5-2**	**Friction Velocity U* (m/s) = 0.10 x (Us/Ur) x U^+_{10}**			
Month (1987)	**mph**	**m/s**	**mph**	**m/s**					**Us/Ur = 0.2**	**Us/Ur = 0.6**	**Us/Ur = 0.9**	**Us/Ur = 1.1**
January	25	11.30	25	11.38	200		NA	A	0.23	0.68	1.02	1.25
February (Max Wind Speed)	**32**	**14.40**	**32**	**14.51**	**320**	**MAX**	**NA**	**A**	**0.29**	**0.87**	**1.31**	**1.60**
March	29	12.90	29	13.00	100		NA	A	0.26	0.78	1.17	1.43
April	29	12.90	29	13.00	130		NA	A	0.26	0.78	1.17	1.43
May	31	13.90	31	14.00	200		NA	A	0.28	0.84	1.26	1.54
June	23	10.30	23	10.38	220		NA	A	0.21	0.62	0.93	1.14
July	**25**	**11.30**	**25**	**11.38**	**190**		**NA**	**A**	**0.23**	**0.68**	**1.02**	**1.25**
August	**24**	**10.80**	**24**	**10.88**	**200**		**NA**	**A**	**0.22**	**0.65**	**0.98**	**1.20**
September	**18**	**8.20**	**18**	**8.26**	**170**		**NA**	**A**	**0.17**	**0.50**	**0.74**	**0.91**
October	31	13.90	31	14.00	190		NA	A	0.28	0.84	1.26	1.54
November	28	12.40	28	12.49	180		NA	A	0.25	0.75	1.12	1.37
December	26	11.80	27	11.89	230		NA	A	0.24	0.71	1.07	1.31
Annual Average	27	12.01	27	**12.10**	**194**	**AVE**	**NA**	**A**	**0.24**	**0.73**	**1.09**	**1.33**
*Wind direction is irrelevant because the pile is circular, therefore use Pile A from AP42 figure 13.2.5-2												
Friction velocity U* exceeds the threshold friction velocity Ut* of 1.12 m/s for an uncrusted coal pile.												

Us/Ur = 0.9; E = kPA									
Month (1987)	**U* (m/s)**	**U* - Ut***	**Erosion Potential*****	**Pile Shape**	**Pile Surface Area (m^2)**	**Emissions PM 30 um (g)**	**Emissions PM < 15 um**	**Emissions PM < 10 um**	**Emissions PM < 2.5 um**
January	NA	NA	0	A	36	0	0	0	0
February (Max Wind Speed)	1.31	0.19	6.64	A	36	239	143	120	48
March	**1.17**	0.05	1.39	A	36	50	30	25	10
April	**1.17**	0.05	1.39	A	36	50	30	25	10
May	**1.26**	0.14	**4.65**	A	36	167	100	84	33
June	NA	NA	0	A	36	0	0	0	0
July	NA	NA	0	A	36	0	0	0	0
August	NA	NA	0	A	36	0	0	0	0
September	NA	NA	0	A	36	0	0	0	0
October	1.26	0.14	4.65	A	36	167	100	84	33
November	NA	NA	0	A	36	0	0	0	0
December	NA	NA	0	A	36	0	0	0	0
Annual Average	NA	NA	0	A	36	0	0	0	0
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	674	404	337	135

Us/Ur = 1.1; E = kPA									
Month (1987)	**U* (m/s)**	**U* - Ut***	**Emission Potential*****	**Pile Shape**	**Pile Surface Area (m^2)**	**Emissions PM 30 um (g)**	**Emissions PM < 15 um**	**Emissions PM < 10 um**	**Emissions PM < 2.5 um**
January	1.25	0.13	4.32	A	0	0	0	0	0
February (Max Wind Speed)	1.60	0.48	25.03	A	0	0	0	0	0
March	1.43	0.31	13.30	A	0	0	0	0	0
April	1.43	0.31	13.30	A	0	0	0	0	0
May	1.54	0.42	20.76	A	0	0	0	0	0
June	1.14	0.02	0.56	A	0	0	0	0	0
July	1.25	0.13	4.32	A	0	0	0	0	0
August	1.20	0.08	2.27	A	0	0	0	0	0
September	NA	NA	0	A	0	0	0	0	0
October	1.54	0.42	20.76	A	0	0	0	0	0
November	1.37	0.25	10.10	A	0	0	0	0	0
December	1.31	0.19	6.74	A	0	0	0	0	0
Annual Average	1.33	0.21	7.85	A	0	0	0	0	0
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	0	0	0	0

***Erosion Potential, P (g/m2) = 58(U* - Ut*)2 + 25(U* - Ut*)

SCREEN MODEL OUTPUT FILE - CPH-6

Particle Size (microns)	30	< 15	< 10	< 2.5
Aerodynamic Particle Size Multiplier	1.0	0.6	0.5	0.2

Pile ID	CPH-6	Input
Height (m)	4.57	Input - 30 ft x (1 m / 3.28 ft)
Surface Area (m^2)	173	Input - 20689 ft^2 x (1 m^2 / 10.7584 ft^2)
Radius (m)	3.65	Calculated using SA = Pi x r x r^2 + h^2
Height to Base Ratio	0.63	Calculated - height/diameter
Pile Area (m2)	42	Calculated Using A = Pi x r^2
Length (m)	6.46	From Map L = w, A = wL = w^2
Width (m)	6.46	From Map L = w, A = wL = w^2

* Since the height to base ratio is greater than 0.2, the pile significantly penetrates the surface wind layer and must be divided into subareas representing different degrees of exposure to wind.

Threshold Friction Velocity (m/s), Ut*	1.12	Obtained from AP42 Table 13.2.5-2 for an uncrusted coal pile
Number of Disturbances per year	12	Input - residue piles are inactive, but choose a maintenance disturbance of once per month
Anemometer Height (m)	9.45	Input - surface station Springfield Airport #93822
Typical Roughness Height (m)	0.005	Guidance from AP-42 Chapter 13.2.5 page 6.

		A		B1		B2		B3	
Pile Subarea	Us/Ur	Percent of Pile Surface Area for Pile A	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)
0.2a	0.2	5%	9	5%	9	3%	5	3%	5
0.2b	0.2	35%	61	2%	3	28%	48	25%	43
0.2c	0.2	NA	0	29%	50	NA	0	NA	0
0.6a	0.6	48%	83	26%	45	29%	50	28%	48
0.6b	0.6	NA	0	24%	42	22%	38	26%	45
0 9	0.9	12%	21	14%	24	15%	26	14%	24
1 1	1.1	NA	0	NA	0	3%	5	4%	7
			173		173		173		173

Fastest Mile U+ Determination Based on 1987 Wind Speed Data from the Springfield, IL Airport (Station ID #93822)												
	$U^{+}_{9.45}$		U^{+}_{10}		Direction (degrees)		Degrees off center	Pile from AP42 fig 13.2.5-2	Friction Velocity U* (m/s) = 0.10 x (Us/Ur) x U^{+}_{10}			
Month (1987)	mph	m/s	mph	m/s					Us/Ur = 0.2	Us/Ur = 0.6	Us/Ur = 0.9	Us/Ur = 1.1
January	25	11.30	25	11.38	200		NA	A	0.23	0.68	1.02	1.25
February (Max Wind Speed)	**32**	**14.40**	**32**	**14.51**	**320**	**MAX**	**NA**	**A**	**0.29**	**0.87**	**1.31**	**1.60**
March	29	12.90	29	13.00	100		NA	A	0.26	0.78	1.17	1.43
April	29	12.90	29	13.00	130		NA	A	0.26	0.78	1.17	1.43
May	31	13.90	31	14.00	200		NA	A	0.28	0.84	1 26	1.54
June	23	10.30	23	10.38	220		NA	A	0.21	0.62	0.93	1.14
July	**25**	**11.30**	**25**	**11.38**	**190**		**NA**	**A**	**0.23**	**0.68**	**1.02**	**1.25**
August	**24**	**10.80**	**24**	**10.88**	**200**		**NA**	**A**	**0.22**	**0.65**	**0.98**	**1.20**
September	18	8.20	18	8.26	170		NA	A	0.17	0.50	0.74	0.91
October	31	13.90	31	14.00	190		NA	A	0.28	0.84	1.26	1.54
November	28	12.40	28	12.49	180		NA	A	0.25	0.75	1.12	1.37
December	26	11.80	27	11.89	230		NA	A	0.24	0.71	1.07	1.31
Annual Average	27	12.01	27	**12.10**	**194**	**AVE**	**NA**	**A**	**0.24**	**0.73**	**1.09**	**1.33**
*Wind direction is irrelevant because the pile is circular, therefore use Pile A from AP42 figure 13.2.5-2												
Friction velocity U* exceeds the threshold friction velocity Ut* of 1.12 m/s for an uncrusted coal pile.												

Us/Ur = 0.9; E = kPA									
Month (1987)	U* (m/s)	U* - Ut*	Erosion Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	0	A	21	0	0	0	0
February (Max Wind Speed)	1.31	0.19	6.64	A	21	138	83	69	28
March	1.17	0.05	1.39	A	21	29	17	14	6
April	1.17	0.05	1.39	A	21	29	17	14	6
May	1.26	0.14	4.65	A	21	97	58	48	19
June	NA	NA	0	A	21	0	0	0	0
July	NA	NA	0	A	21	0	0	0	0
August	NA	NA	0	A	21	0	0	0	0
September	NA	NA	0	A	21	0	0	0	0
October	1.26	0.14	4.65	A	21	97	58	48	19
November	NA	NA	0	A	21	0	0	0	0
December	NA	NA	0	A	21	0	0	0	0
Annual Average	NA	NA	0	A	21	0	0	0	0
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	389	233	194	78

Us/Ur = 1.1; E = kPA									
Month (1987)	U* (m/s)	U* - Ut*	Emission Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	1.25	0.13	4.32	A	0	0	0	0	0
February (Max Wind Speed)	1.60	0.48	25.03	A	0	0	0	0	0
March	1.43	0.31	13.30	A	0	0	0	0	0
April	1.43	0.31	13.30	A	0	0	0	0	0
May	1.54	0.42	20.76	A	0	0	0	0	0
June	1.14	0.02	0.56	A	0	0	0	0	0
July	1.25	0.13	4.32	A	0	0	0	0	0
August	1.20	0.08	2.27	A	0	0	0	0	0
September	NA	NA	0	A	0	0	0	0	0
October	1.54	0.42	20.76	A	0	0	0	0	0
November	1.37	0.25	10.10	A	0	0	0	0	0
December	1.31	0.19	6.74	A	0	0	0	0	0
Annual Average	1.33	0.21	7.85	A	0	0	0	0	0
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	0	0	0	0

***Erosion Potential, P (g/m2) = 58(U* - Ut*)2 + 25(U* - Ut*)

SCREEN MODEL OUTPUT FILE - RRO-12

Particle Size (microns)	30	< 15	< 10	< 2.5
Aerodynamic Particle Size Multiplier	1.0	0.6	0.5	0.2

Pile ID	RRO-12	Input
Height (m)	4.57	Input - 30 ft x (1 m / 3.28 ft)
Surface Area (m^2)	1,945	Input - 20689 ft^2 x (1 m^2 / 10.7584 ft^2)
Radius (m)	3.49	Calculated using SA = Pi x r x r^2 + h^2
Height to Base Ratio	0.27	Calculated - height/diameter
Pile Area (m2)	227	Calculated Using A = Pi x r^2
Length (m)	21.29	From Map L = 2w, A = wL = $2w^2$
Width (m)	10.64	From Map L = 2w, A = wL = $2w^2$
* Since the height to base ratio is greater than 0.2, the pile significantly penetrates the surface wind layer and must be divided into subareas representing different degrees of exposure to wind.		

Threshold Friction Velocity (m/s), Ut*	1.12	Obtained from AP42 Table 13.2.5-2 for an uncrusted coal pile
Number of Disturbances per year	12	Input - residue piles are inactive, but choose a maintenance disturbance of once per month
Anemometer Height (m)	9.45	Input - surface station Springfield Airport #93822
Typical Roughness Height (m)	0.005	Guidance from AP-42 Chapter 13.2.5 page 6.

		A		B1		B2		B3	
Pile Subarea	Us/Ur	Percent of Pile Surface Area for Pile A	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)
0.2a	0.2	5%	97	5%	**97**	3%	58	3%	58
0.2b	0.2	35%	681	2%	**39**	28%	545	25%	486
0.2c	0.2	NA	0	29%	**564**	NA	0	NA	0
0.6a	0.6	48%	933	26%	**506**	29%	564	28%	545
0.6b	0.6	NA	0	24%	**467**	22%	428	26%	506
0.9	0.9	12%	233	14%	**272**	15%	292	14%	272
1.1	1.1	NA	0	NA	**0**	3%	58	4%	78
			1,945		1,945		1,945		1,945

Fastest Mile U+ Determination Based on 1987 Wind Speed Data from the Springfield, IL Airport (Station ID #93822)												
	$U^+_{9.45}$		U^+_{10}		Direction (degrees)		Degrees off center	Pile from AP42 fig 13.2.5-2	Friction Velocity U* (m/s) = 0.10 x (Us/Ur) x U^+_{10}			
Month (1987)	mph	m/s	mph	m/s					Us/Ur = 0.2	Us/Ur = 0.6	Us/Ur = 0.9	Us/Ur = 1.1
January	25	11.30	25	11.38	200		20	B2	0.23	0.68	1.02	1.25
February (Max Wind Speed)	**32**	**14.40**	**32**	**14.51**	**320**	**MAX**	**40**	**B3**	**0.29**	**0.87**	**1.31**	**1.60**
March	29	12.90	29	13.00	100		10	B2	0.26	0.78	1.17	1.43
April	29	12.90	29	13.00	130		40	B3	0.26	0.78	1.17	1.43
May	31	13.90	31	14.00	200		20	B2	0.28	0.84	1.26	1.54
June	23	10.30	23	10.38	220		40	B3	0.21	0.62	0.93	1.14
July	**25**	**11.30**	**25**	**11.38**	**190**		**10**	**B2**	**0.23**	**0.68**	**1.02**	**1.25**
August	24	10.80	24	10.88	200		20	B2	0.22	0.65	0.98	1.20
September	18	8.20	18	8.26	170		10	B2	0.17	0.50	0.74	0.91
October	31	13.90	31	14.00	190		10	B2	0.28	0.84	1.26	1.54
November	28	12.40	28	12.49	180		0	B1	0.25	0.75	1.12	1.37
December	26	11.80	27	11.89	230		40	B3	0.24	0.71	1.07	1.31
Annual Average	27	12.01	27	**12.10**	**194**	**AVE**	**14**	**B2**	**0.24**	**0.73**	**1.09**	**1.33**
*Average wind direction is 14° off center, therefore use Pile B2 from AP42 figure 13.2.5-2												
Friction velocity U* exceeds the threshold friction velocity Ut* of 1.12 m/s for an uncrusted coal pile.												

Us/Ur = 0.9; E = kPA									
Month (1987)	U* (m/s)	U* - Ut*	Erosion Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	0	B2	**292**	0	0	0	0
February (Max Wind Speed)	1.31	0.19	6.64	B3	**272**	1,808	1,085	904	362
March	1.17	0.05	1.39	B2	**292**	404	242	202	81
April	1.17	0.05	1.39	B3	**272**	377	226	189	75
May	1.26	0.14	4.65	B2	**292**	1,357	814	678	271
June	NA	NA	0	B3	**272**	0	0	0	0
July	NA	NA	0	B2	**292**	0	0	0	0
August	NA	NA	0	B2	**292**	0	0	0	0
September	NA	NA	0	B2	**292**	0	0	0	0
October	1.26	0.14	4.65	B2	**292**	1,357	814	678	271
November	NA	NA	0	B1	**272**	0	0	0	0
December	NA	NA	0	B3	**272**	0	0	0	0
Annual Average	NA	NA	0	B2	**292**	0	0	0	0
Annual TOTAL (g/yr)	NA	NA	NA	NA	**NA**	5,304	3,182	2,652	1,061

Us/Ur = 1.1; E = kPA									
Month (1987)	U* (m/s)	U* - Ut*	Emission Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	1.25	0.13	4.32	B2	58	252	151	126	50
February (Max Wind Speed)	1.60	0.48	25.03	B3	78	1,947	1,168	973	389
March	1.43	0.31	13.30	B2	58	776	466	388	155
April	1.43	0.31	13.30	B3	78	1,035	621	517	207
May	1.54	0.42	20.76	B2	58	1,211	727	606	242
June	1.14	0.02	0.56	B3	78	44	26	22	9
July	1.25	0.13	4.32	B2	58	252	151	126	50
August	1.20	0.08	2.27	B2	58	132	79	66	26
September	NA	NA	0	B2	58	0	0	0	0
October	1.54	0.42	20.76	B2	58	1,211	727	606	242
November	1.37	0.25	10.10	B1	0	0	0	0	0
December	1.31	0.19	6.74	B3	78	524	314	262	105
Annual Average	1.33	0.21	7.85	B2	58	458	275	229	92
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	7,385	4,431	3,692	1,477

***Erosion Potential, P (g/m2) = 58(U* - Ut*)2 + 25(U* - Ut*)

SCREEN MODEL OUTPUT FILE - NP-15

Particle Size (microns)	30	< 15	< 10	< 2.5
Aerodynamic Particle Size Multiplier	1.0	0.6	0.5	0.2

Pile ID	NP-15	Input
Height (m)	3.66	Input - 30 ft x (1 m / 3.28 ft)
Surface Area (m^2)	552	Input - 20689 ft^2 x (1 m^2 / 10.7584 ft^2)
Radius (m)	5.56	Calculated using SA = Pi x r x r^2 + h^2
Height to Base Ratio	0.33	Calculated - height/diameter
Pile Area (m2)	97	Calculated Using A = Pi x r^2
Length (m)	9.85	From Map L = w, A = wL = w^2
Width (m)	9.85	From Map L = w, A = wL = w^2

* Since the height to base ratio is greater than 0.2, the pile significantly penetrates the surface wind layer and must be divided into subareas representing different degrees of exposure to wind.

Threshold Friction Velocity (m/s), Ut*	1.12	Obtained from AP42 Table 13.2.5-2 for an uncrusted coal pile
Number of Disturbances per year	12	Input - residue piles are inactive, but choose a maintenance disturbance of once per month
Anemometer Height (m)	9.45	Input - surface station Springfield Airport #93822
Typical Roughness Height (m)	0.005	Guidance from AP-42 Chapter 13.2.5 page 6.

Pile Subarea	Us/Ur	A		B1		B2		B3	
		Percent of Pile Surface Area for Pile A	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)
0.2a	0.2	5%	28	5%	28	3%	17	3%	17
0.2b	0.2	35%	193	2%	11	28%	155	25%	138
0.2c	0.2	NA	0	29%	160	NA	0	NA	0
0.6a	0.6	48%	265	26%	144	29%	160	28%	155
0.6b	0.6	NA	0	24%	133	22%	122	26%	144
0.9	0.9	12%	66	14%	77	15%	83	14%	77
1.1	1.1	NA	0	NA	0	3%	17	4%	22
			552		552		552		552

Fastest Mile U+ Determination Based on 1987 Wind Speed Data from the Springfield, IL Airport (Station ID #93822)

Month (1987)	$U^*_{9.45}$ mph	$U^*_{9.45}$ m/s	U^+_{10} mph	U^+_{10} m/s	Direction (degrees)		Degrees off center	Pile from AP42 fig 13.2.5-2	Friction Velocity U* (m/s) = 0.10 x (Us/Ur) x U^+_{10}: Us/Ur = 0.2	Us/Ur = 0.6	Us/Ur = 0.9	Us/Ur = 1.1
January	25	11.30	25	11.38	200		NA	A	0.23	0.68	1.02	1.25
February (Max Wind Speed)	**32**	**14.40**	**32**	**14.51**	**320**	**MAX**	**NA**	**A**	**0.29**	**0.87**	**1.31**	**1.60**
March	29	12.90	29	13.00	100		NA	A	0.26	0.78	1.17	1.43
April	29	12.90	29	13.00	130		NA	A	0.26	0.78	1.17	1.43
May	31	13.90	31	14.00	200		NA	A	0.28	0.84	1.26	1.54
June	23	10.30	23	10.38	220		NA	A	0.21	0.62	0.93	1.14
July	**25**	**11.30**	**25**	**11.38**	**190**		**NA**	**A**	**0.23**	**0.68**	**1.02**	**1.25**
August	24	10.80	24	10.88	200		NA	A	0.22	0.65	0.98	1.20
September	18	8.20	18	8.26	170		NA	A	0.17	0.50	0.74	0.91
October	31	13.90	31	14.00	190		NA	A	0.28	0.84	1.26	1.54
November	28	12.40	28	12.49	180		NA	A	0.25	0.75	1.12	1.37
December	26	11.80	27	11.89	230		NA	A	0.24	0.71	1.07	1.31
Annual Average	27	12.01	27	**12.10**	**194**	**AVE**	**NA**	**A**	**0.24**	**0.73**	**1.09**	**1.33**

*Wind direction is irrelevant because the pile is circular, therefore use Pile A from AP42 figure 13.2.5-2

Friction velocity U* exceeds the threshold friction velocity Ut* of 1.12 m/s for an uncrusted coal pile.

Us/Ur = 0.9; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Erosion Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	0	A	66	0	0	0	0
February (Max Wind Speed)	1.31	0.19	6.64	A	66	440	264	220	88
March	1.17	0.05	1.39	A	66	92	55	46	18
April	1.17	0.05	1.39	A	66	92	55	46	18
May	1.26	0.14	4.65	A	66	308	185	154	62
June	NA	NA	0	A	66	0	0	0	0
July	NA	NA	0	A	66	0	0	0	0
August	NA	NA	0	A	66	0	0	0	0
September	NA	NA	0	A	66	0	0	0	0
October	1.26	0.14	4.65	A	66	308	185	154	62
November	NA	NA	0	A	66	0	0	0	0
December	NA	NA	0	A	66	0	0	0	0
Annual Average	NA	NA	0	A	66	0	0	0	0
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	1,240	744	620	248

Us/Ur = 1.1; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Emission Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	1.25	0.13	4.32	A	0	0	0	0	0
February (Max Wind Speed)	1.60	0.48	25.03	A	0	0	0	0	0
March	1.43	0.31	13.30	A	0	0	0	0	0
April	1.43	0.31	13.30	A	0	0	0	0	0
May	1.54	0.42	20.76	A	0	0	0	0	0
June	1.14	0.02	0.56	A	0	0	0	0	0
July	1.25	0.13	4.32	A	0	0	0	0	0
August	1.20	0.08	2.27	A	0	0	0	0	0
September	NA	NA	0	A	0	0	0	0	0
October	1.54	0.42	20.76	A	0	0	0	0	0
November	1.37	0.25	10.10	A	0	0	0	0	0
December	1.31	0.19	6.74	A	0	0	0	0	0
Annual Average	1.33	0.21	7.85	A	0	0	0	0	0
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	0	0	0	0

***Erosion Potential, P (g/m2) = 58(U* - Ut*)2 + 25(U* - Ut*)

SCREEN MODEL OUTPUT FILE - NP-16

Particle Size (microns)	30	< 15	< 10	< 2.5
Aerodynamic Particle Size Multiplier	1.0	0.6	0.5	0.2

Pile ID	NP-16	Input
Height (m)	7.62	Input - 30 ft x (1 m / 3.28 ft)
Surface Area (m^2)	829	Input - 20689 ft^2 x (1 m^2 / 10.7584 ft^2)
Radius (m)	6.26	Calculated using SA = Pi x r x r^2 + h^2
Height to Base Ratio	0.61	Calculated - height/diameter
Pile Area (m2)	123	Calculated Using A = Pi x r^2
Length (m)	11.10	From Map L = w, A = wL = w^2
Width (m)	11.10	From Map L = w, A = wL = w^2

** Since the height to base ratio is greater than 0.2, the pile significantly penetrates the surface wind layer and must be divided into subareas representing different degrees of exposure to wind.*

Threshold Friction Velocity (m/s), Ut*	1.12	Obtained from AP42 Table 13.2.5-2 for an uncrusted coal pile
Number of Disturbances per year	12	Input - residue piles are inactive, but choose a maintenance disturbance of once per month
Anemometer Height (m)	9.45	Input - surface station Springfield Airport #93822
Typical Roughness Height (m)	0.005	Guidance from AP-42 Chapter 13.2.5 page 6.

Pile Subarea	Us/Ur	A		B1		B2		B3	
		Percent of Pile Surface Area for Pile A	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)
0.2a	0.2	5%	41	5%	41	3%	25	3%	25
0.2b	0.2	35%	290	2%	17	28%	232	25%	207
0.2c	0.2	NA	0	29%	240	NA	0	NA	0
0.6a	0.6	48%	398	26%	216	29%	240	28%	232
0.6b	0.6	NA	0	24%	199	22%	182	26%	216
0.9	0.9	12%	100	14%	116	15%	124	14%	116
1.1	1.1	NA	0	NA	0	3%	25	4%	33
			829		829		829		829

Fastest Mile U+ Determination Based on 1987 Wind Speed Data from the Springfield, IL Airport (Station ID #93822)

Month (1987)	$U^*_{9.45}$ mph	$U^*_{9.45}$ m/s	U^*_{10} mph	U^*_{10} m/s	Direction (degrees)		Degrees off center	Pile from AP42 fig 13.2.5-2	Friction Velocity U* (m/s) = 0.10 x (Us/Ur) x U^*_{10}: Us/Ur = 0.2	Us/Ur = 0.6	Us/Ur = 0.9	Us/Ur = 1.1
January	25	11.30	25	11.38	200		NA	A	0.23	0.68	1.02	1.25
February (Max Wind Speed)	**32**	**14.40**	**32**	**14.51**	**320**	**MAX**	**NA**	**A**	**0.29**	**0.87**	**1.31**	**1.60**
March	29	12.90	29	13.00	100		NA	A	0.26	0.78	1.17	1.43
April	29	12.90	29	13.00	130		NA	A	0.26	0.78	1.17	1.43
May	31	13.90	31	14.00	200		NA	A	0.28	0.84	1.26	1.54
June	23	10.30	23	10.38	220		NA	A	0.21	0.62	0.93	1.14
July	**25**	**11.30**	**25**	**11.38**	**190**		**NA**	**A**	**0.23**	**0.68**	**1.02**	**1.25**
August	24	10.80	24	10.88	200		NA	A	0.22	0.65	0.98	1.20
September	18	8.20	18	8.26	170		NA	A	0.17	0.50	0.74	0.91
October	31	13.90	31	14.00	190		NA	A	0.28	0.84	1.26	1.54
November	28	12.40	28	12.49	180		NA	A	0.25	0.75	1.12	1.37
December	26	11.80	27	11.89	230		NA	A	0.24	0.71	1.07	1.31
Annual Average	27	12.01	27	**12.10**	**194**	**AVE**	**NA**	**A**	**0.24**	**0.73**	**1.09**	**1.33**

*Wind direction is irrelevant because the pile is circular, therefore use Pile A from AP42 figure 13.2.5-2

Friction velocity U* exceeds the threshold friction velocity Ut* of 1.12 m/s for an uncrusted coal pile.

Us/Ur = 0.9; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Erosion Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	0	A	100	0	0	0	0
February (Max Wind Speed)	1.31	0.19	6.64	A	100	661	397	331	132
March	1.17	0.05	1.39	A	100	138	83	69	28
April	1.17	0.05	1.39	A	100	138	83	69	28
May	1.26	0.14	4.65	A	100	463	278	231	93
June	NA	NA	0	A	100	0	0	0	0
July	NA	NA	0	A	100	0	0	0	0
August	NA	NA	0	A	100	0	0	0	0
September	NA	NA	0	A	100	0	0	0	0
October	1.26	0.14	4.65	A	100	463	278	231	93
November	NA	NA	0	A	100	0	0	0	0
December	NA	NA	0	A	100	0	0	0	0
Annual Average	NA	NA	0	A	100	0	0	0	0
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	1,863	1,118	931	373

Us/Ur = 1.1; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Emission Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	1.25	0.13	4.32	A	0	0	0	0	0
February (Max Wind Speed)	1.60	0.48	25.03	A	0	0	0	0	0
March	1.43	0.31	13.30	A	0	0	0	0	0
April	1.43	0.31	13.30	A	0	0	0	0	0
May	1.54	0.42	20.76	A	0	0	0	0	0
June	1.14	0.02	0.56	A	0	0	0	0	0
July	1.25	0.13	4.32	A	0	0	0	0	0
August	1.20	0.08	2.27	A	0	0	0	0	0
September	NA	NA	0	A	0	0	0	0	0
October	1.54	0.42	20.76	A	0	0	0	0	0
November	1.37	0.25	10.10	A	0	0	0	0	0
December	1.31	0.19	6.74	A	0	0	0	0	0
Annual Average	1.33	0.21	7.85	A	0	0	0	0	0
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	0	0	0	0

***Erosion Potential, P (g/m2) = 58(U* - Ut*)2 + 25(U* - Ut*)

SCREEN MODEL OUTPUT FILE - NP-13

Particle Size (microns)	30	< 15	< 10	< 2.5
Aerodynamic Particle Size Multiplier	1.0	0.6	0.5	0.2

Pile ID	NP-13	Input
Height (m)	0.91	Input - 30 ft x (1 m / 3.28 ft)
Surface Area (m^2)	1,202	Input - 20689 ft^2 x (1 m^2 / 10.7584 ft^2)
Radius (m)	7.26	Calculated using SA = Pi x r x r^2 + h^2
Height to Base Ratio	0.06	Calculated - height/diameter
Pile Area (m2)	165	Calculated Using A = Pi x r^2
Length (m)	22.28	From Map L = 3w, A = wL = $3w^2$
Width (m)	7.43	From Map L = 3w, A = wL = $3w^2$

* Since the height to base ratio is less than 0.2, the pile does not significantly penetrate the surface wind layer. Therefore, no sub-areas needed, and U* = 0.053 x U^+_{10}

Threshold Friction Velocity (m/s), Ut*	1.12	Obtained from AP42 Table 13.2.5-2 for an uncrusted coal pile
Number of Disturbances per year	12	Input - residue piles are inactive, but choose a maintenance disturbance of once per month
Anemometer Height (m)	9.45	Input - surface station Springfield Airport #93822
Typical Roughness Height (m)	0.005	Guidance from AP-42 Chapter 13.2.5 page 6.

Pile Subarea	Us/Ur	A		B1		B2		B3	
		Percent of Pile Surface Area for Pile A	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)
0.2a	0.2	5%	60	5%	60	3%	36	3%	36
0.2b	0.2	35%	421	2%	24	28%	337	25%	300
0.2c	0.2	NA	0	29%	349	NA	0	NA	0
0.6a	0.6	48%	577	26%	312	29%	349	28%	337
0.6b	0.6	NA	0	24%	288	22%	264	26%	312
0.9	0.9	12%	144	14%	168	15%	180	14%	168
1.1	1.1	NA	0	NA	0	3%	36	4%	48
			1,202		1,202		1,202		1,202

Fastest Mile U+ Determination Based on 1987 Wind Speed Data from the Springfield, IL Airport (Station ID #93822)

Month (1987)	$U^+_{9.45}$ mph	$U^+_{9.45}$ m/s	U^+_{10} mph	U^+_{10} m/s	Direction (degrees)		Degrees off center	Pile from AP42 fig 13.2.5-2	Friction Velocity U* (m/s) = 0.053 x U^+_{10} Us/Ur = NA	Us/Ur = NA	Us/Ur = NA	Us/Ur = NA
January	25	11.30	25	11.38	200		NA	NA	NA	NA	NA	0.60
February (Max Wind Speed)	**32**	**14.40**	**32**	**14.51**	**320**	**MAX**	**NA**	**NA**	**NA**	**NA**	**NA**	0.77
March	29	12.90	29	13.00	100		NA	NA	NA	NA	NA	0.69
April	29	12.90	29	13.00	130		NA	NA	NA	NA	NA	0.69
May	31	13.90	31	14.00	200		NA	NA	NA	NA	NA	0.74
June	23	10.30	23	10.38	220		NA	NA	NA	NA	NA	0.55
July	**25**	**11.30**	**25**	**11.38**	**190**		**NA**	**NA**	**NA**	**NA**	**NA**	0.60
August	24	10.80	24	10.88	200		NA	NA	NA	NA	NA	0.58
September	18	8.20	18	8.26	170		NA	NA	NA	NA	NA	0.44
October	31	13.90	31	14.00	190		NA	NA	NA	NA	NA	0.74
November	28	12.40	28	12.49	180		NA	NA	NA	NA	NA	0.66
December	26	11.80	27	11.89	230		NA	NA	NA	NA	NA	0.63
Annual Average	27	12.01	27	**12.10**	**194**	**AVE**	**NA**	**NA**	**NA**	**NA**	**NA**	0.64

*Sub-areas not required; height to base ratio less than 0.2 and therefore little to no penetration into the surface wind layer.

Friction velocity U* exceeds the threshold friction velocity Ut* of 1.12 m/s for an uncrusted coal pile.

Us/Ur = 0.9; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Erosion Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	NA	NA	NA	NA	NA	NA	NA
February (Max Wind Speed)	NA	NA	NA	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA	NA	NA	NA
June	NA	NA	NA	NA	NA	NA	NA	NA	NA
July	NA	NA	NA	NA	NA	NA	NA	NA	NA
August	NA	NA	NA	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA	NA	NA	NA
November	NA	NA	NA	NA	NA	NA	NA	NA	NA
December	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual Average	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	NA	NA	NA	NA

Us/Ur = 1.1; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Emission Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	NA	NA	NA	NA	NA	NA	NA
February (Max Wind Speed)	NA	NA	NA	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA	NA	NA	NA
June	NA	NA	NA	NA	NA	NA	NA	NA	NA
July	NA	NA	NA	NA	NA	NA	NA	NA	NA
August	NA	NA	NA	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA	NA	NA	NA
November	NA	NA	NA	NA	NA	NA	NA	NA	NA
December	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual Average	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	NA	NA	NA	NA

***Erosion Potential, P (g/m2) = 58(U* - Ut*)2 + 25(U* - Ut*)

SCREEN MODEL OUTPUT FILE - NP-14

Particle Size (microns)	30	< 15	< 10	< 2.5
Aerodynamic Particle Size Multiplier	1.0	0.6	0.5	0.2

Pile ID	NP-14	Input
Height (m)	0.91	Input - 30 ft x (1 m / 3.28 ft)
Surface Area (m^2)	1,264	Input - 20689 ft^2 x (1 m^2 / 10.7584 ft^2)
Radius (m)	7.38	Calculated using SA = Pi x r x r^2 + h^2
Height to Base Ratio	0.06	Calculated - height/diameter
Pile Area (m2)	171	Calculated Using A = Pi x r^2
Length (m)	22.66	From Map L = 3w, A = wL = $3w^2$
Width (m)	7.55	From Map L = 3w, A = wL = $3w^2$

* Since the height to base ratio is less than 0.2. the pile does not significantly penetrate the surface wind layer Therefore, no sub-areas needed, and U* = 0.053 x U^+_{10}

Threshold Friction Velocity (m/s), Ut*	1.12	Obtained from AP42 Table 13.2.5-2 for an uncrusted coal pile
Number of Disturbances per year	12	Input - residue piles are inactive, but choose a maintenance disturbance of once per month
Anemometer Height (m)	9.45	Input - surface station Springfield Airport #93822
Typical Roughness Height (m)	0.005	Guidance from AP-42 Chapter 13.2.5 page 6.

		A		B1		B2		B3	
Pile Subarea	Us/Ur	Percent of Pile Surface Area for Pile A	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)
0.2a	0.2	5%	63	5%	63	3%	38	3%	38
0.2b	0.2	35%	443	2%	25	28%	354	25%	316
0.2c	0.2	NA	0	29%	367	NA	0	NA	0
0.6a	0.6	48%	607	26%	329	29%	367	28%	354
0.6b	0.6	NA	0	24%	303	22%	278	26%	329
0.9	0.9	12%	152	14%	177	15%	190	14%	177
1.1	1.1	NA	0	NA	0	3%	38	4%	51
			1,264		1,264		1,264		1,264

Fastest Mile U+ Determination Based on 1987 Wind Speed Data from the Springfield, IL Airport (Station ID #93822)												
	$U^+_{9.45}$		U^+_{10}		Direction (degrees)		Degrees off center	Pile from AP42 fig 13.2.5-2	Friction Velocity U* (m/s) = 0.053 x U^+_{10}			
Month (1987)	mph	m/s	mph	m/s					Us/Ur = NA	Us/Ur = NA	Us/Ur = NA	Us/Ur = NA
January	25	11.30	25	11.38	200		NA	NA	NA	NA	NA	0.60
February (Max Wind Speed)	**32**	**14.40**	**32**	**14.51**	**320**	**MAX**	**NA**	**NA**	**NA**	**NA**	**NA**	0.77
March	29	12.90	29	13.00	100		NA	NA	NA	NA	NA	0.69
April	29	12.90	29	13.00	130		NA	NA	NA	NA	NA	0.69
May	31	13.90	31	14.00	200		NA	NA	NA	NA	NA	0.74
June	23	10.30	23	10.38	220		NA	NA	NA	NA	NA	0.55
July	**25**	**11.30**	**25**	**11.38**	**190**		**NA**	**NA**	**NA**	**NA**	**NA**	0.60
August	**24**	**10.80**	**24**	10.88	200		NA	NA	NA	NA	NA	0.58
September	18	8.20	18	8.26	170		NA	NA	NA	NA	NA	0.44
October	31	13.90	31	14.00	190		NA	NA	NA	NA	NA	0.74
November	28	12.40	28	12.49	180		NA	NA	NA	NA	NA	0.66
December	26	11.80	27	11.89	230		NA	NA	NA	NA	NA	0.63
Annual Average	27	12.01	27	**12.10**	**194**	**AVE**	**NA**	**NA**	**NA**	**NA**	**NA**	0.64
*Sub-areas not required; height to base ratio less than 0.2 and therefore little to no penetration into the surface wind layer.												
Friction velocity U* exceeds the threshold friction velocity Ut* of 1.12 m/s for an uncrusted coal pile.												

Us/Ur = 0.9; E = kPA									
Month (1987)	U* (m/s)	U* - Ut*	Erosion Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	NA	NA	NA	NA	NA	NA	NA
February (Max Wind Speed)	NA	NA	NA	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA	NA	NA	NA
June	NA	NA	NA	NA	NA	NA	NA	NA	NA
July	NA	NA	NA	NA	NA	NA	NA	NA	NA
August	NA	NA	NA	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA	NA	NA	NA
November	NA	NA	NA	NA	NA	NA	NA	NA	NA
December	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual Average	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	NA	NA	NA	NA

Us/Ur = 1.1; E = kPA									
Month (1987)	U* (m/s)	U* - Ut*	Emission Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	NA	NA	NA	NA	NA	NA	NA
February (Max Wind Speed)	NA	NA	NA	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA	NA	NA	NA
June	NA	NA	NA	NA	NA	NA	NA	NA	NA
July	NA	NA	NA	NA	NA	NA	NA	NA	NA
August	NA	NA	NA	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA	NA	NA	NA
November	NA	NA	NA	NA	NA	NA	NA	NA	NA
December	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual Average	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	NA	NA	NA	NA

***Erosion Potential, P (g/m2) = 58(U* - Ut*)2 + 25(U* - Ut*)

SCREEN MODEL OUTPUT FILE - NP-14

Particle Size (microns)	30	< 15	< 10	< 2.5
Aerodynamic Particle Size Multiplier	1.0	0.6	0.5	0.2

Pile ID	NP-14	Input
Height (m)	1.52	Input - 30 ft x (1 m / 3.28 ft)
Surface Area (m^2)	2,065	Input - 20689 ft^2 x (1 m^2 / 10.7584 ft^2)
Radius (m)	8.69	Calculated using SA = Pi x r x $r^2 + h^2$
Height to Base Ratio	0.09	Calculated - height/diameter
Pile Area (m2)	237	Calculated Using A = Pi x r^2
Length (m)	24.36	From Map L = 2.5w, A = wL = $3w^2$
Width (m)	9.74	From Map L = 2.5w, A = wL = $3w^2$

* Since the height to base ratio is less than 0.2, the pile does not significantly penetrate the *surface wind layer. Therefore, no sub-areas needed, and U* = 0.053 x U^+_{10}*

Threshold Friction Velocity (m/s), Ut*	1.12	Obtained from AP42 Table 13.2.5-2 for an uncrusted coal pile
Number of Disturbances per year	12	Input - residue piles are inactive, but choose a maintenance disturbance of once per month
Anemometer Height (m)	9.45	Input - surface station Springfield Airport #93822
Typical Roughness Height (m)	0.005	Guidance from AP-42 Chapter 13.2.5 page 6.

		A		B1		B2		B3	
Pile Subarea	Us/Ur	Percent of Pile Surface Area for Pile A	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)
0.2a	0.2	5%	103	5%	103	3%	62	3%	62
0.2b	0.2	35%	723	2%	41	28%	578	25%	516
0.2c	0.2	NA	0	29%	599	NA	0	NA	0
0.6a	0.6	48%	991	26%	537	29%	599	28%	578
0.6b	0.6	NA	0	24%	496	22%	454	26%	537
0.9	0.9	12%	248	14%	289	15%	310	14%	289
1.1	1.1	NA	0	NA	0	3%	62	4%	83
			2,065		2,065		2,065		2,065

Fastest Mile U+ Determination Based on 1987 Wind Speed Data from the Springfield, IL Airport (Station ID #93822)

	$U^+_{9.45}$		U^+_{10}		Direction (degrees)		Degrees off center	Pile from AP42 fig 13.2.5-2	Friction Velocity U* (m/s) = 0.053 x U^+_{10}			
Month (1987)	mph	m/s	mph	m/s					Us/Ur = NA	Us/Ur = NA	Us/Ur = NA	Us/Ur = NA
January	25	11.30	25	11.38	200		NA	NA	NA	NA	NA	0.60
February (Max Wind Speed)	**32**	**14.40**	**32**	**14.51**	**320**	**MAX**	**NA**	**NA**	**NA**	**NA**	**NA**	0.77
March	29	12.90	29	13.00	100		NA	NA	NA	NA	NA	0.69
April	29	12.90	29	13.00	130		NA	NA	NA	NA	NA	0.69
May	31	13.90	31	14.00	200		NA	NA	NA	NA	NA	0.74
June	23	10.30	23	10.38	220		NA	NA	NA	NA	NA	0.55
July	25	11.30	25	11.38	190		NA	NA	NA	NA	NA	0.60
August	24	10.80	24	10.88	200		NA	NA	NA	NA	NA	0.58
September	18	8.20	18	8.26	170		NA	NA	NA	NA	NA	0.44
October	31	13.90	31	14.00	190		NA	NA	NA	NA	NA	0.74
November	28	12.40	28	12.49	180		NA	NA	NA	NA	NA	0.66
December	26	11.80	27	11.89	230		NA	NA	NA	NA	NA	0.63
Annual Average	27	12.01	27	**12.10**	**194**	**AVE**	**NA**	**NA**	**NA**	**NA**	**NA**	0.64

*Sub-areas not required; height to base ratio less than 0.2 and therefore little to no penetration into the surface wind layer.

Friction velocity U* exceeds the threshold friction velocity Ut* of 1.12 m/s for an uncrusted coal pile.

Us/Ur = 0.9; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Erosion Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	NA	NA	NA	NA	NA	NA	NA
February (Max Wind Speed)	NA	NA	NA	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA	NA	NA	NA
June	NA	NA	NA	NA	NA	NA	NA	NA	NA
July	NA	NA	NA	NA	NA	NA	NA	NA	NA
August	NA	NA	NA	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA	NA	NA	NA
November	NA	NA	NA	NA	NA	NA	NA	NA	NA
December	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual Average	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	NA	NA	NA	NA

Us/Ur = 1.1; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Emission Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	NA	NA	NA	NA	NA	NA	NA
February (Max Wind Speed)	NA	NA	NA	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA	NA	NA	NA
June	NA	NA	NA	NA	NA	NA	NA	NA	NA
July	NA	NA	NA	NA	NA	NA	NA	NA	NA
August	NA	NA	NA	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA	NA	NA	NA
November	NA	NA	NA	NA	NA	NA	NA	NA	NA
December	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual Average	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	NA	NA	NA	NA

***Erosion Potential, P (g/m2) = 58(U* - Ut*)2 + 25(U* - Ut*)

SCREEN MODEL OUTPUT FILE - MP1-21

Particle Size (microns)	30	< 15	< 10	< 2.5
Aerodynamic Particle Size Multiplier	1.0	0.6	0.5	0.2

Pile ID	MP1-21	Input
Height (m)	1.83	Input - 30 ft x (1 m / 3.28 ft)
Surface Area (m^2)	1,394	Input - 20689 ft^2 x (1 m^2 / 10.7584 ft^2)
Radius (m)	7.62	Calculated using SA = Pi x r x $r^2 + h^2$
Height to Base Ratio	0.12	Calculated - height/diameter
Pile Area (m2)	182	Calculated Using A = Pi x r^2
Length (m)	19.10	From Map L = 2w, A = wL = $2w^2$
Width (m)	9.55	From Map L = 2w, A = wL = $2w^2$

* Since the height to base ratio is less than 0.2, the pile does not significantly penetrate the surface wind layer. Therefore, no sub-areas needed, and U* = 0.053 x U^+_{10}

Threshold Friction Velocity (m/s), Ut*	1.12	Obtained from AP42 Table 13.2.5-2 for an uncrusted coal pile
Number of Disturbances per year	12	Input - residue piles are inactive, but choose a maintenance disturbance of once per month
Anemometer Height (m)	9.45	Input - surface station Springfield Airport #93822
Typical Roughness Height (m)	0.005	Guidance from AP-42 Chapter 13.2.5 page 6.

		A		B1		B2		B3	
Pile Subarea	Us/Ur	Percent of Pile Surface Area for Pile A	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)
0.2a	0.2	5%	70	5%	70	3%	42	3%	42
0.2b	0.2	35%	488	2%	28	28%	390	25%	349
0.2c	0.2	NA	0	29%	404	NA	0	NA	0
0.6a	0.6	48%	669	26%	363	29%	404	28%	390
0.6b	0.6	NA	0	24%	335	22%	307	26%	363
0.9	0.9	12%	167	14%	195	15%	209	14%	195
1.1	1.1	NA	0	NA	0	3%	42	4%	56
			1,394		1,394		1,394		1,394

Fastest Mile U+ Determination Based on 1987 Wind Speed Data from the Springfield, IL Airport (Station ID #93822)												
	$U^+_{9.45}$		U^+_{10}		Direction (degrees)		Degrees off center	Pile from AP42 fig 13.2.5-2	Friction Velocity U* (m/s) = 0.053 x U^+_{10}			
Month (1987)	mph	m/s	mph	m/s					Us/Ur = NA	Us/Ur = NA	Us/Ur = NA	Us/Ur = NA
January	25	11.30	25	11.38	200		NA	NA	NA	NA	NA	0.60
February (Max Wind Speed)	**32**	**14.40**	**32**	**14.51**	**320**	**MAX**	**NA**	**NA**	**NA**	**NA**	**NA**	0.77
March	29	12.90	29	13.00	100		NA	NA	NA	NA	NA	0.69
April	29	12.90	29	13.00	130		NA	NA	NA	NA	NA	0.69
May	31	13.90	31	14.00	200		NA	NA	NA	NA	NA	0.74
June	23	10.30	23	10.38	220		NA	NA	NA	NA	NA	0.55
July	25	11.30	25	11.38	190		NA	NA	NA	NA	NA	0.60
August	24	10.80	24	10.88	200		NA	NA	NA	NA	NA	0.58
September	18	8.20	18	8.26	170		NA	NA	NA	NA	NA	0.44
October	31	13.90	31	14.00	190		NA	NA	NA	NA	NA	0.74
November	28	12.40	28	12.49	180		NA	NA	NA	NA	NA	0.66
December	26	11.80	27	11.89	230		NA	NA	NA	NA	NA	0.63
Annual Average	27	12.01	27	**12.10**	**194**	**AVE**	**NA**	**NA**	**NA**	**NA**	**NA**	0.64
*Sub-areas not required; height to base ratio less than 0.2 and therefore little to no penetration into the surface wind layer.												
Friction velocity U* exceeds the threshold friction velocity Ut* of 1.12 m/s for an uncrusted coal pile.												

			Us/Ur = 0.9;	E = kPA					
Month (1987)	U* (m/s)	U* - Ut*	Erosion Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	NA	NA	NA	NA	NA	NA	NA
February (Max Wind Speed)	NA	NA	NA	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA	NA	NA	NA
June	NA	NA	NA	NA	NA	NA	NA	NA	NA
July	NA	NA	NA	NA	NA	NA	NA	NA	NA
August	NA	NA	NA	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA	NA	NA	NA
November	NA	NA	NA	NA	NA	NA	NA	NA	NA
December	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual Average	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	NA	NA	NA	NA

			Us/Ur = 1.1;	E = kPA					
Month (1987)	U* (m/s)	U* - Ut*	Emission Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	NA	NA	NA	NA	NA	NA	NA
February (Max Wind Speed)	NA	NA	NA	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA	NA	NA	NA
June	NA	NA	NA	NA	NA	NA	NA	NA	NA
July	NA	NA	NA	NA	NA	NA	NA	NA	NA
August	NA	NA	NA	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA	NA	NA	NA
November	NA	NA	NA	NA	NA	NA	NA	NA	NA
December	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual Average	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	NA	NA	NA	NA

***Erosion Potential, P (g/m2) = 58(U* - Ut*)2 + 25(U* - Ut*)

SCREEN MODEL OUTPUT FILE - RR1-2

Particle Size (microns)	30	< 15	< 10	< 2.5
Aerodynamic Particle Size Multiplier	1.0	0.6	0.5	0.2

Pile ID	RR1-2	Input
Height (m)	1.22	Input - 30 ft x (1 m / 3.28 ft)
Surface Area (m^2)	1,462	Input - 20689 ft^2 x (1 m^2 / 10.7584 ft^2)
Radius (m)	7.75	Calculated using SA = Pi x r x r^2 + h^2
Height to Base Ratio	0.08	Calculated - height/diameter
Pile Area (m2)	189	Calculated Using A = Pi x r^2
Length (m)	19.42	From Map L = 2w, A = wL = $2w^2$
Width (m)	9.71	From Map L = 2w, A = wL = $2w^2$

* Since the height to base ratio is less than 0.2, the pile does not significantly penetrate the surface wind layer. Therefore, no sub-areas needed, and U* = 0.053 x U^+_{10}

Threshold Friction Velocity (m/s), Ut*	1.12	Obtained from AP42 Table 13.2.5-2 for an uncrusted coal pile
Number of Disturbances per year	12	Input - residue piles are inactive, but choose a maintenance disturbance of once per month
Anemometer Height (m)	9.45	Input - surface station Springfield Airport #93822
Typical Roughness Height (m)	0.005	Guidance from AP-42 Chapter 13.2.5 page 6.

		A		B1		B2		B3	
Pile Subarea	Us/Ur	Percent of Pile Surface Area for Pile A	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)
0.2a	0.2	5%	73	5%	73	3%	44	3%	44
0.2b	0.2	35%	512	2%	29	28%	409	25%	366
0.2c	0.2	NA	0	29%	424	NA	0	NA	0
0.6a	0.6	48%	702	26%	380	29%	424	28%	409
0.6b	0.6	NA	0	24%	351	22%	322	26%	380
0.9	0.9	12%	175	14%	205	15%	219	14%	205
1.1	1.1	NA	0	NA	0	3%	44	4%	58
			1,462		1,462		1,462		1,462

Fastest Mile U+ Determination Based on 1987 Wind Speed Data from the Springfield, IL Airport (Station ID #93822)

Month (1987)	$U^+_{9.45}$ mph	$U^+_{9.45}$ m/s	U^+_{10} mph	U^+_{10} m/s	Direction (degrees)		Degrees off center	Pile from AP42 fig 13.2.5-2	Friction Velocity U* (m/s) = 0.053 x U^+_{10} Us/Ur = NA	Us/Ur = NA	Us/Ur = NA	Us/Ur = NA
January	25	11.30	25	11.38	200		NA	NA	NA	NA	NA	0.60
February (Max Wind Speed)	**32**	**14.40**	**32**	**14.51**	**320**	**MAX**	**NA**	**NA**	**NA**	**NA**	**NA**	0.77
March	29	12.90	29	13.00	100		NA	NA	NA	NA	NA	0.69
April	29	12.90	29	13.00	130		NA	NA	NA	NA	NA	0.69
May	31	13.90	31	14.00	200		NA	NA	NA	NA	NA	0.74
June	23	10.30	23	10.38	220		NA	NA	NA	NA	NA	0.55
July	25	11.30	25	11.38	190		NA	NA	NA	NA	NA	0.60
August	24	10.80	24	10.88	200		NA	NA	NA	NA	NA	0.58
September	18	8.20	18	8.26	170		NA	NA	NA	NA	NA	0.44
October	31	13.90	31	14.00	190		NA	NA	NA	NA	NA	0.74
November	28	12.40	28	12.49	180		NA	NA	NA	NA	NA	0.66
December	26	11.80	27	11.89	230		NA	NA	NA	NA	NA	0.63
Annual Average	27	12.01	27	**12.10**	**194**	**AVE**	**NA**	**NA**	**NA**	**NA**	**NA**	0.64

*Sub-areas not required; height to base ratio less than 0.2 and therefore little to no penetration into the surface wind layer.

Friction velocity U* exceeds the threshold friction velocity Ut* of 1.12 m/s for an uncrusted coal pile.

Us/Ur = 0.9; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Erosion Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	NA	NA	NA	NA	NA	NA	NA
February (Max Wind Speed)	NA	NA	NA	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA	NA	NA	NA
June	NA	NA	NA	NA	NA	NA	NA	NA	NA
July	NA	NA	NA	NA	NA	NA	NA	NA	NA
August	NA	NA	NA	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA	NA	NA	NA
November	NA	NA	NA	NA	NA	NA	NA	NA	NA
December	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual Average	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	NA	NA	NA	NA

Us/Ur = 1.1; E = kPA

Month (1987)	U* (m/s)	U* - Ut*	Emission Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	NA	NA	NA	NA	NA	NA	NA
February (Max Wind Speed)	NA	NA	NA	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA	NA	NA	NA
June	NA	NA	NA	NA	NA	NA	NA	NA	NA
July	NA	NA	NA	NA	NA	NA	NA	NA	NA
August	NA	NA	NA	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA	NA	NA	NA
November	NA	NA	NA	NA	NA	NA	NA	NA	NA
December	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual Average	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	NA	NA	NA	NA

***Erosion Potential, P (g/m2) = 58(U* - Ut*)2 + 25(U* - Ut*)

SCREEN MODEL OUTPUT FILE - RR1-1

Particle Size (microns)	30	< 15	< 10	< 2.5
Aerodynamic Particle Size Multiplier	1.0	0.6	0.5	0.2

Pile ID	RR1-1	Input
Height (m)	1.22	Input - 30 ft x (1 m / 3.28 ft)
Surface Area (m^2)	894	Input - 20689 ft^2 x (1 m^2 / 10.7584 ft^2)
Radius (m)	6.57	Calculated using SA = Pi x r x r^2 + h^2
Height to Base Ratio	0.09	Calculated - height/diameter
Pile Area (m2)	136	Calculated Using A = Pi x r^2
Length (m)	16.48	From Map L = 2w, A = wL = $2w^2$
Width (m)	8.24	From Map L = 2w, A = wL = $2w^2$

* Since the height to base ratio is less than 0.2, the pile does not significantly penetrate the surface wind layer. Therefore, no sub-areas needed, and U* = 0.053 x U^+_{10}

Threshold Friction Velocity (m/s), Ut*	1.12	Obtained from AP42 Table 13.2.5-2 for an uncrusted coal pile
Number of Disturbances per year	12	Input - residue piles are inactive, but choose a maintenance disturbance of once per month
Anemometer Height (m)	9.45	Input - surface station Springfield Airport #93822
Typical Roughness Height (m)	0.005	Guidance from AP-42 Chapter 13.2.5 page 6.

		A		B1		B2		B3	
Pile Subarea	Us/Ur	Percent of Pile Surface Area for Pile A	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)	Percent of Pile Surface Area for Pile B2	Surface Area (m^2)
0.2a	0.2	5%	45	5%	45	3%	27	3%	27
0.2b	0.2	35%	313	2%	18	28%	250	25%	223
0.2c	0.2	NA	0	29%	259	NA	0	NA	0
0.6a	0.6	48%	429	26%	232	29%	259	28%	250
0.6b	0.6	NA	0	24%	215	22%	197	26%	232
0.9	0.9	12%	107	14%	125	15%	134	14%	125
1.1	1.1	NA	0	NA	0	3%	27	4%	36
			894		894		894		894

Fastest Mile U+ Determination Based on 1987 Wind Speed Data from the Springfield, IL Airport (Station ID #93822)												
	$U^+_{9.45}$		U^+_{10}		Direction (degrees)		Degrees off center	Pile from AP42 fig 13.2.5-2	Friction Velocity U* (m/s) = 0.053 x U^+_{10}			
Month (1987)	mph	m/s	mph	m/s					Us/Ur = NA	Us/Ur = NA	Us/Ur = NA	Us/Ur = NA
January	25	11.30	25	11.38	200		NA	NA	NA	NA	NA	0.60
February (Max Wind Speed)	**32**	**14.40**	**32**	**14.51**	**320**	**MAX**	**NA**	**NA**	**NA**	**NA**	**NA**	0.77
March	29	12.90	29	13.00	100		NA	NA	NA	NA	NA	0.69
April	29	12.90	29	13.00	130		NA	NA	NA	NA	NA	0.69
May	31	13.90	31	14.00	200		NA	NA	NA	NA	NA	0.74
June	23	10.30	23	10.38	220		NA	NA	NA	NA	NA	0.55
July	25	11.30	25	11.38	190		NA	NA	NA	NA	NA	0.60
August	24	10.80	24	10.88	200		NA	NA	NA	NA	NA	0.58
September	18	8.20	18	8.26	170		NA	NA	NA	NA	NA	0.44
October	31	13.90	31	14.00	190		NA	NA	NA	NA	NA	0.74
November	28	12.40	28	12.49	180		NA	NA	NA	NA	NA	0.66
December	26	11.80	27	11.89	230		NA	NA	NA	NA	NA	0.63
Annual Average	27	12.01	27	**12.10**	**194**	**AVE**	**NA**	**NA**	**NA**	**NA**	**NA**	0.64
*Sub-areas not required; height to base ratio less than 0.2 and therefore little to no penetration into the surface wind layer.												
Friction velocity U* exceeds the threshold friction velocity Ut* of 1.12 m/s for an uncrusted coal pile.												

Us/Ur = 0.9; E = kPA									
Month (1987)	U* (m/s)	U* - Ut*	Erosion Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	NA	NA	NA	NA	NA	NA	NA
February (Max Wind Speed)	NA	NA	NA	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA	NA	NA	NA
June	NA	NA	NA	NA	NA	NA	NA	NA	NA
July	NA	NA	NA	NA	NA	NA	NA	NA	NA
August	NA	NA	NA	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA	NA	NA	NA
November	NA	NA	NA	NA	NA	NA	NA	NA	NA
December	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual Average	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	NA	NA	NA	NA

Us/Ur = 1.1; E = kPA									
Month (1987)	U* (m/s)	U* - Ut*	Emission Potential***	Pile Shape	Pile Surface Area (m^2)	Emissions PM 30 um (g)	Emissions PM < 15 um	Emissions PM < 10 um	Emissions PM < 2.5 um
January	NA	NA	NA	NA	NA	NA	NA	NA	NA
February (Max Wind Speed)	NA	NA	NA	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA	NA	NA	NA
April	NA	NA	NA	NA	NA	NA	NA	NA	NA
May	NA	NA	NA	NA	NA	NA	NA	NA	NA
June	NA	NA	NA	NA	NA	NA	NA	NA	NA
July	NA	NA	NA	NA	NA	NA	NA	NA	NA
August	NA	NA	NA	NA	NA	NA	NA	NA	NA
September	NA	NA	NA	NA	NA	NA	NA	NA	NA
October	NA	NA	NA	NA	NA	NA	NA	NA	NA
November	NA	NA	NA	NA	NA	NA	NA	NA	NA
December	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual Average	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual TOTAL (g/yr)	NA	NA	NA	NA	NA	NA	NA	NA	NA

***Erosion Potential, P (g/m2) = 58(U* - Ut*)2 + 25(U* - Ut*)

Residue Pile CPH-6

SCREEN3 Output File
10-micron Emission Rate

03/29/2005
12:53:46

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - CPH-6 - 10 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.297000E-06
SOURCE HEIGHT (M) = 4.5700
LENGTH OF LARGER SIDE (M) = 6.4600
LENGTH OF SMALLER SIDE (M) = 6.4600
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.1636E-07	1	1.0	1.0	320.0	4.57	45.
100.	0.7547E-01	5	1.0	1.0	10000.0	4.57	35.
200.	0.6496E-01	6	1.0	1.0	10000.0	4.57	31.
300.	0.4425E-01	6	1.0	1.0	10000.0	4.57	34.
400.	0.3072E-01	6	1.0	1.0	10000.0	4.57	43.
500.	0.2242E-01	6	1.0	1.0	10000.0	4.57	31.
600.	0.1708E-01	6	1.0	1.0	10000.0	4.57	36.
700.	0.1347E-01	6	1.0	1.0	10000.0	4.57	34.
800.	0.1104E-01	6	1.0	1.0	10000.0	4.57	39.
900.	0.9253E-02	6	1.0	1.0	10000.0	4.57	31.

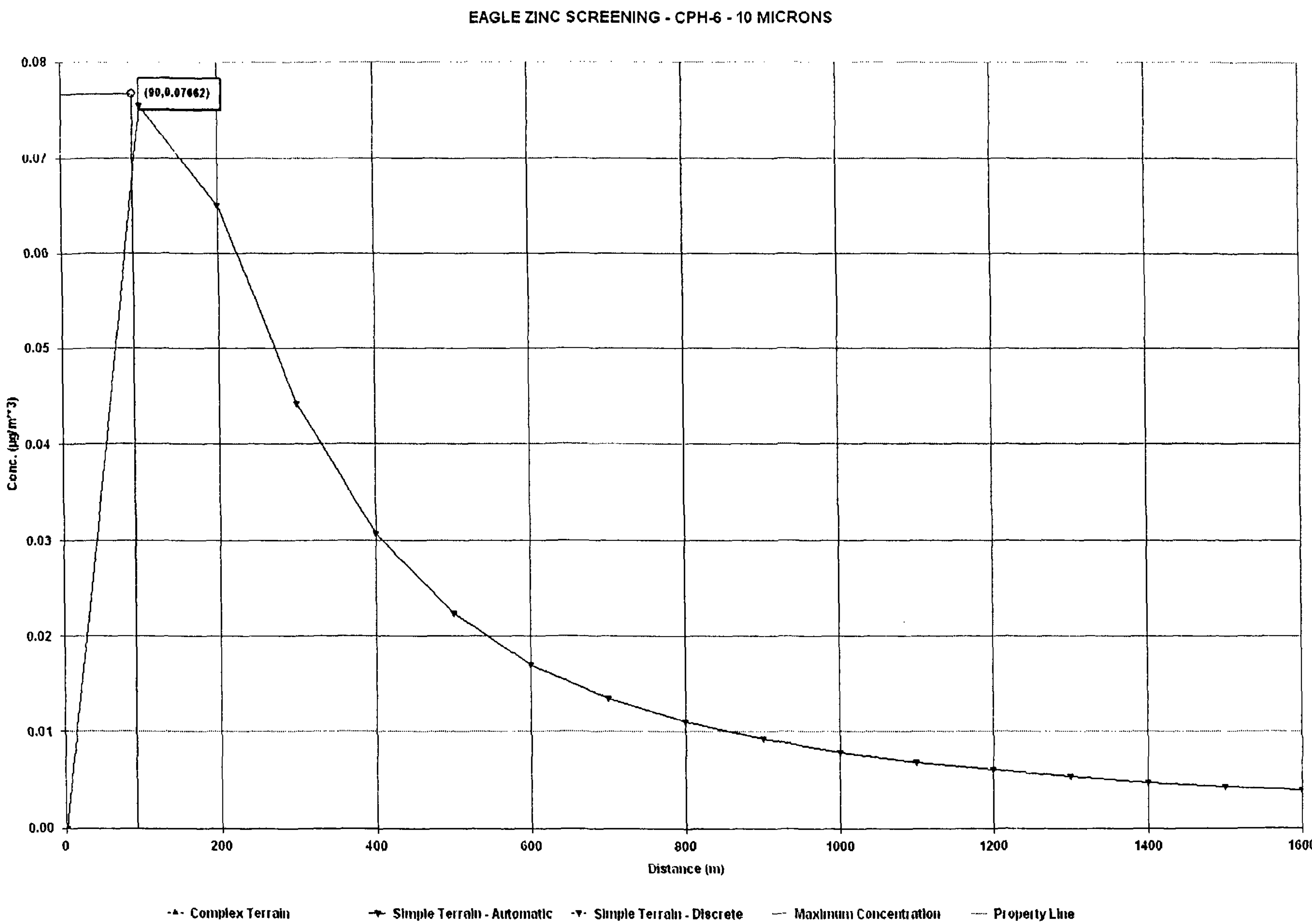
```
 1000. 0.7887E-02   6    1.0    1.0 10000.0   4.57    31.
 1100. 0.6850E-02   6    1.0    1.0 10000.0   4.57    31.
 1200. 0.6020E-02   6    1.0    1.0 10000.0   4.57    31.
 1300. 0.5342E-02   6    1.0    1.0 10000.0   4.57    31.
 1400. 0.4782E-02   6    1.0    1.0 10000.0   4.57    39.
 1500. 0.4312E-02   6    1.0    1.0 10000.0   4.57    31.
 1600. 0.3913E-02   6    1.0    1.0 10000.0   4.57    39.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND     1. M:
   90. 0.7662E-01   5    1.0    1.0 10000.0   4.57    43.

   ***************************************
   *** SUMMARY OF SCREEN MODEL RESULTS ***
   ***************************************

 CALCULATION       MAX CONC    DIST TO   TERRAIN
  PROCEDURE      (UG/M**3)   MAX (M)   HT (M)
--------------   -----------  -------  -------
SIMPLE TERRAIN    0.7662E-01      90.       0.

***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************
```



EAGLE ZINC SCREENING - CPH-6 - 10 MICRONS
(90,0.07662)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
Conc. (µg/m**3)
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

Residue Pile CPH-6

SCREEN3 Output File
30-micron Emission Rate

03/29/2005
12:51:27

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - CPH-6 - 30 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.593000E-06
SOURCE HEIGHT (M) = 4.5700
LENGTH OF LARGER SIDE (M) = 6.4600
LENGTH OF SMALLER SIDE (M) = 6.4600
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.3266E-07	1	1.0	1.0	320.0	4.57	45.
100.	0.1507	5	1.0	1.0	10000.0	4.57	35.
200.	0.1297	6	1.0	1.0	10000.0	4.57	31.
300.	0.8836E-01	6	1.0	1.0	10000.0	4.57	34.
400.	0.6134E-01	6	1.0	1.0	10000.0	4.57	43.
500.	0.4476E-01	6	1.0	1.0	10000.0	4.57	31.
600.	0.3411E-01	6	1.0	1.0	10000.0	4.57	36.
700.	0.2690E-01	6	1.0	1.0	10000.0	4.57	34.
800.	0.2205E-01	6	1.0	1.0	10000.0	4.57	39.
900.	0.1847E-01	6	1.0	1.0	10000.0	4.57	31.

1000.	0.1575E-01	6	1.0	1.0	10000.0	4.57	31.
1100.	0.1368E-01	6	1.0	1.0	10000.0	4.57	31.
1200.	0.1202E-01	6	1.0	1.0	10000.0	4.57	31.
1300.	0.1067E-01	6	1.0	1.0	10000.0	4.57	31.
1400.	0.9547E-02	6	1.0	1.0	10000.0	4.57	39.
1500.	0.8609E-02	6	1.0	1.0	10000.0	4.57	31.
1600.	0.7813E-02	6	1.0	1.0	10000.0	4.57	39.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

90. 0.1530 5 1.0 1.0 10000.0 4.57 43.

****

*** SUMMARY OF SCREEN MODEL RESULTS ***

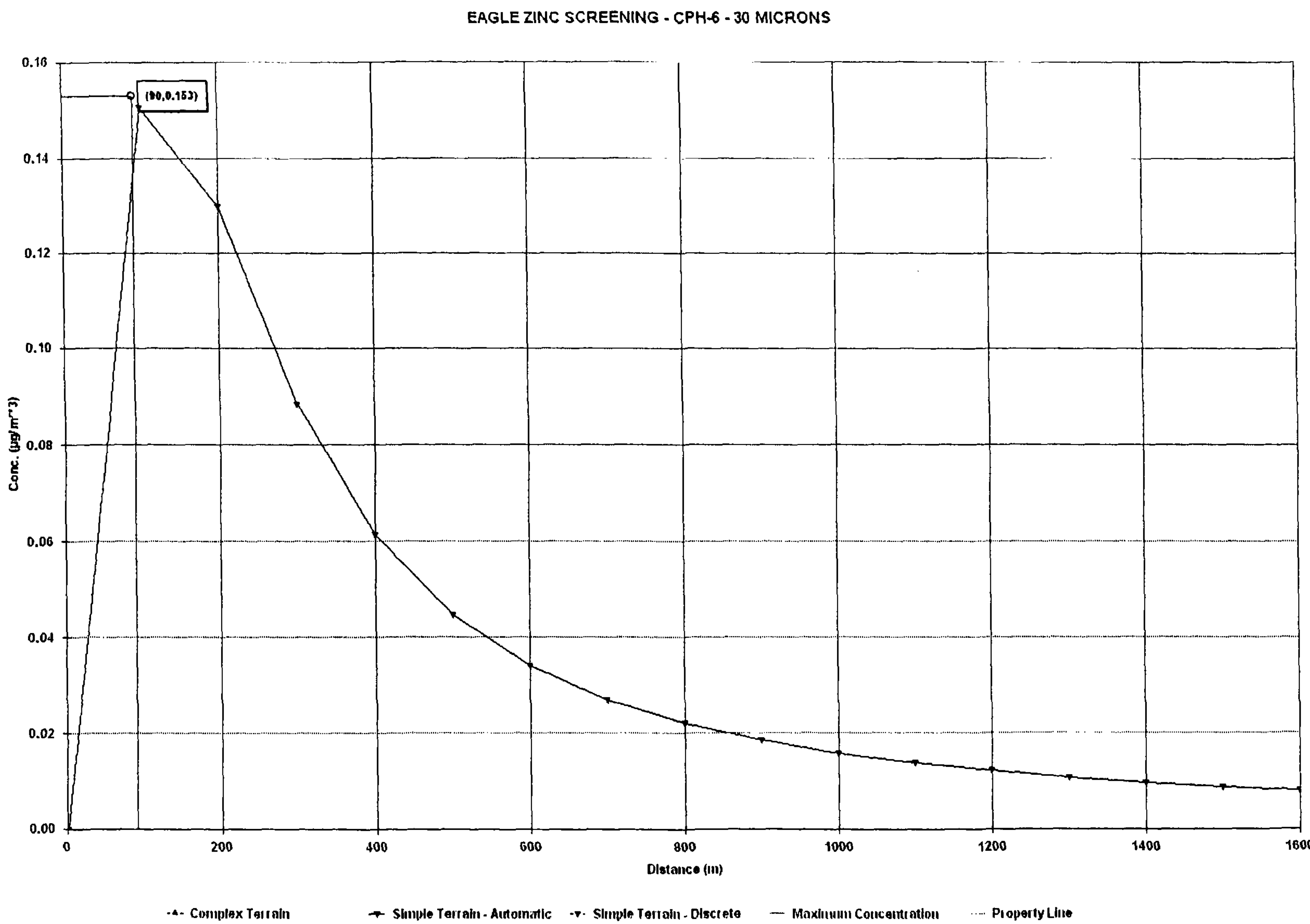
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.1530	90.	0.

****

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

****



EAGLE ZINC SCREENING - CPH-6 - 30 MICRONS
(90,0.153)
Conc. (µg/m^3)
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

Residue Pile CPH-9

SCREEN3 Output File
10-micron Emission Rate

03/29/2005
12:48:45

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - CPH-9 - 10 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.297000E-06
SOURCE HEIGHT (M) = 5.4900
LENGTH OF LARGER SIDE (M) = 7.8200
LENGTH OF SMALLER SIDE (M) = 7.8200
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.6306E-08	1	1.0	1.0	320.0	5.49	45.
100.	0.7481E-01	5	1.0	1.0	10000.0	5.49	40.
200.	0.7127E-01	6	1.0	1.0	10000.0	5.49	36.
300.	0.5568E-01	6	1.0	1.0	10000.0	5.49	42.
400.	0.4087E-01	6	1.0	1.0	10000.0	5.49	31.
500.	0.3069E-01	6	1.0	1.0	10000.0	5.49	41.
600.	0.2378E-01	6	1.0	1.0	10000.0	5.49	31.
700.	0.1897E-01	6	1.0	1.0	10000.0	5.49	38.
800.	0.1566E-01	6	1.0	1.0	10000.0	5.49	33.
900.	0.1318E-01	6	1.0	1.0	10000.0	5.49	31.

1000.	0.1128E-01	6	1.0	1.0	10000.0	5.49	31.
1100.	0.9823E-02	6	1.0	1.0	10000.0	5.49	33.
1200.	0.8652E-02	6	1.0	1.0	10000.0	5.49	31.
1300.	0.7693E-02	6	1.0	1.0	10000.0	5.49	31.
1400.	0.6898E-02	6	1.0	1.0	10000.0	5.49	33.
1500.	0.6228E-02	6	1.0	1.0	10000.0	5.49	40.
1600.	0.5659E-02	6	1.0	1.0	10000.0	5.49	33.

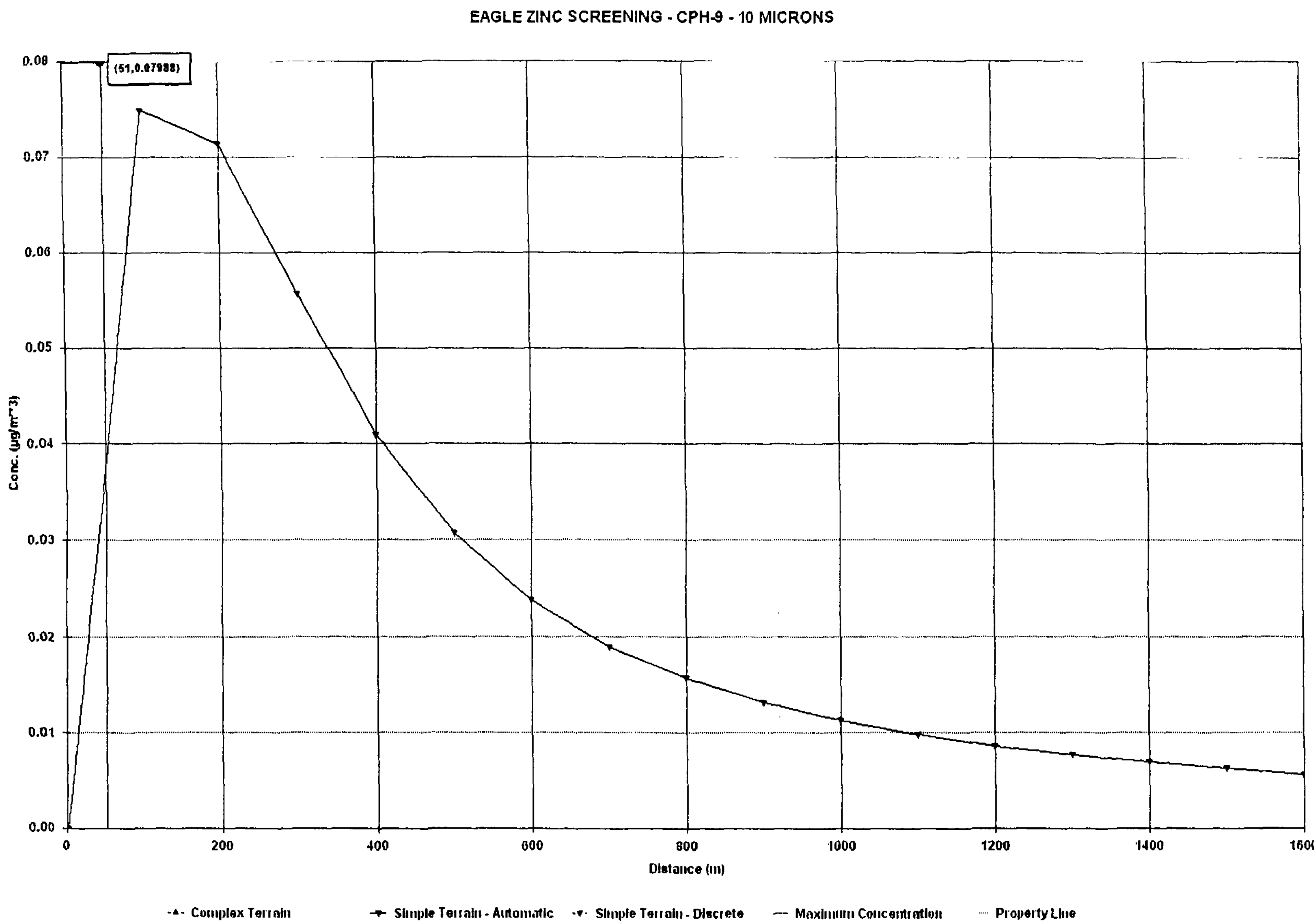
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

51.	0.7988E-01	3	1.0	1.0	320.0	5.49	45.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.7988E-01	51.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****


EAGLE ZINC SCREENING - CPH-9 - 10 MICRONS
(51,0.07988)
Conc. (µg/m^3)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

Residue Pile CPH-9

SCREEN3 Output File
30-micron Emission Rate

03/29/2005
12:45:55

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - CPH-9 - 30 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.593000E-06
SOURCE HEIGHT (M) = 5.4900
LENGTH OF LARGER SIDE (M) = 7.8200
LENGTH OF SMALLER SIDE (M) = 7.8200
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.1259E-07	1	1.0	1.0	320.0	5.49	45.
100.	0.1494	5	1.0	1.0	10000.0	5.49	40.
200.	0.1423	6	1.0	1.0	10000.0	5.49	36.
300.	0.1112	6	1.0	1.0	10000.0	5.49	42.
400.	0.8159E-01	6	1.0	1.0	10000.0	5.49	31.
500.	0.6127E-01	6	1.0	1.0	10000.0	5.49	41.
600.	0.4749E-01	6	1.0	1.0	10000.0	5.49	31.
700.	0.3788E-01	6	1.0	1.0	10000.0	5.49	38.
800.	0.3127E-01	6	1.0	1.0	10000.0	5.49	33.
900.	0.2632E-01	6	1.0	1.0	10000.0	5.49	31.

1000.	0.2252E-01	6	1.0	1.0	10000.0	5.49	31.
1100.	0.1961E-01	6	1.0	1.0	10000.0	5.49	33.
1200.	0.1727E-01	6	1.0	1.0	10000.0	5.49	31.
1300.	0.1536E-01	6	1.0	1.0	10000.0	5.49	31.
1400.	0.1377E-01	6	1.0	1.0	10000.0	5.49	33.
1500.	0.1244E-01	6	1.0	1.0	10000.0	5.49	40.
1600.	0.1130E-01	6	1.0	1.0	10000.0	5.49	33.

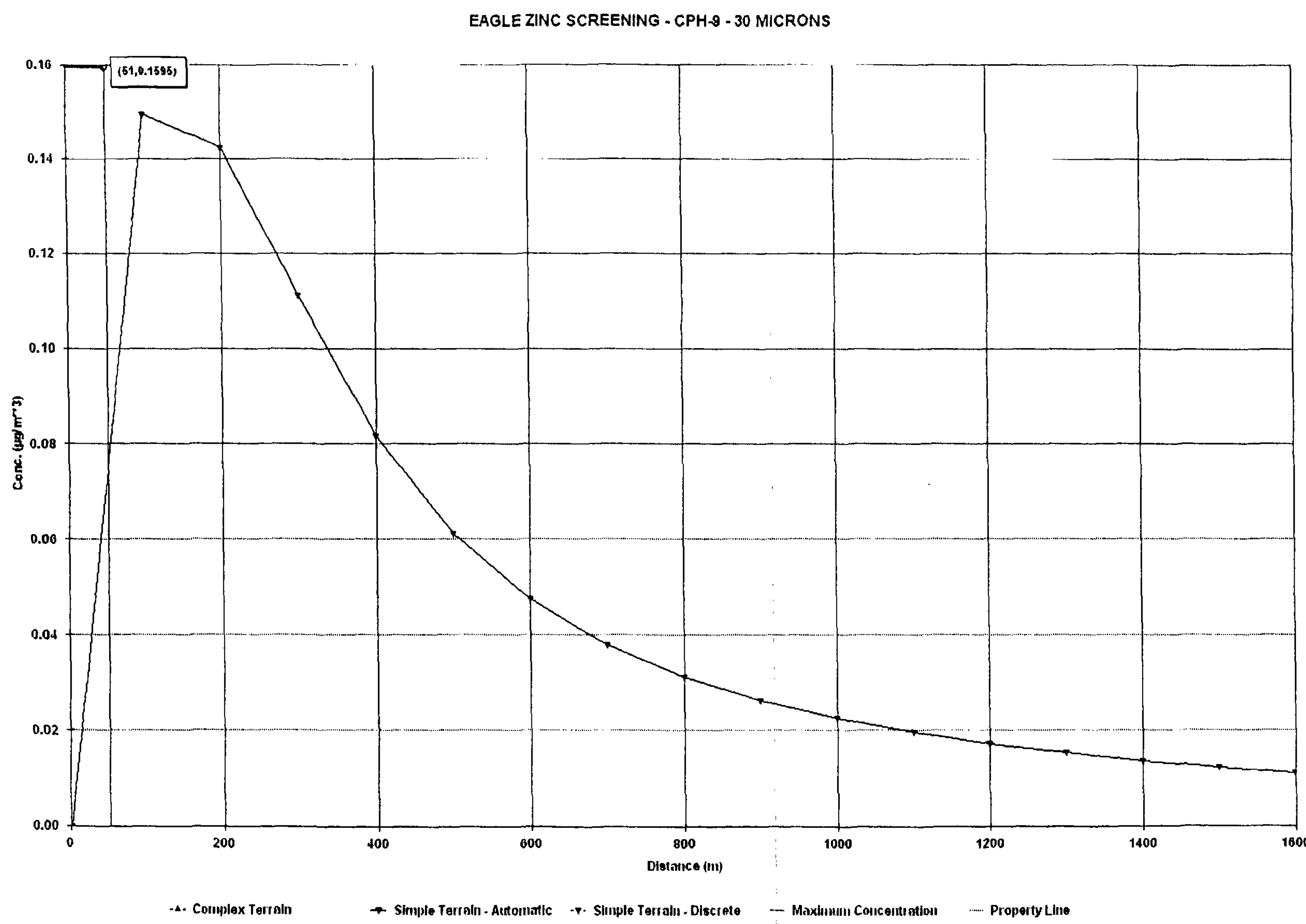
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

51. 0.1595 3 1.0 1.0 320.0 5.49 45.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.1595	51.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****



EAGLE ZINC SCREENING - CPH-9 - 30 MICRONS
(51,0.1595)
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Conc. (µg/m^3)
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

Residue Pile NP-15

SCREEN3 Output File
10-micron Emission Rate

03/31/2005
12:28:07

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc - NP-15 - 10 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.297000E-06
SOURCE HEIGHT (M) = 3.6600
LENGTH OF LARGER SIDE (M) = 9.8500
LENGTH OF SMALLER SIDE (M) = 9.8500
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.5616E-03	1	1.0	1.0	320.0	3.66	45.
100.	0.2277	6	1.0	1.0	10000.0	3.66	45.
200.	0.1822	6	1.0	1.0	10000.0	3.66	39.
300.	0.1138	6	1.0	1.0	10000.0	3.66	32.
400.	0.7623E-01	6	1.0	1.0	10000.0	3.66	45.
500.	0.5458E-01	6	1.0	1.0	10000.0	3.66	31.
600.	0.4113E-01	6	1.0	1.0	10000.0	3.66	43.
700.	0.3221E-01	6	1.0	1.0	10000.0	3.66	31.
800.	0.2629E-01	6	1.0	1.0	10000.0	3.66	31.
900.	0.2196E-01	6	1.0	1.0	10000.0	3.66	39.

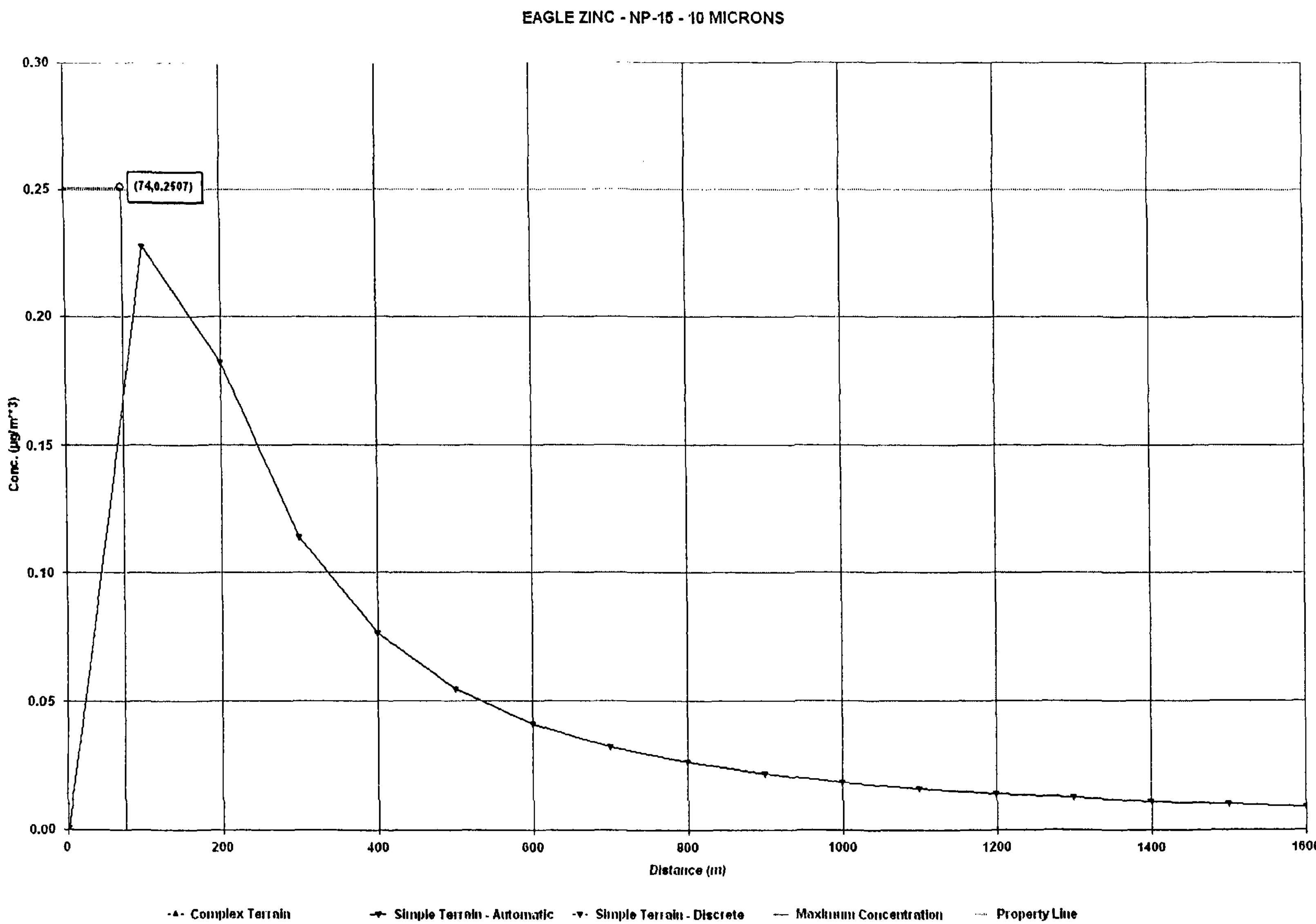
```
 1000. 0.1866E-01   6    1.0    1.0 10000.0   3.66    33.
 1100. 0.1618E-01   6    1.0    1.0 10000.0   3.66    31.
 1200. 0.1419E-01   6    1.0    1.0 10000.0   3.66    38.
 1300. 0.1258E-01   6    1.0    1.0 10000.0   3.66    44.
 1400. 0.1125E-01   6    1.0    1.0 10000.0   3.66    31.
 1500. 0.1013E-01   6    1.0    1.0 10000.0   3.66    31.
 1600. 0.9190E-02   6    1.0    1.0 10000.0   3.66    31.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND     1. M:
   74. 0.2507       5    1.0    1.0 10000.0   3.66    45.

   ***************************************
   *** SUMMARY OF SCREEN MODEL RESULTS ***
   ***************************************

 CALCULATION       MAX CONC    DIST TO   TERRAIN
  PROCEDURE       (UG/M**3)   MAX (M)    HT (M)
--------------   -----------  -------   -------
SIMPLE TERRAIN     0.2507        74.        0.


***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************
```


EAGLE ZINC - NP-15 - 10 MICRONS
(74,0.2507)
Conc. (µg/m^3)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

<u>Residue Pile NP-15</u>

SCREEN3 Output File
30-micron Emission Rate

03/31/2005
12:25:15

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc - NP-15 - 30 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.593000E-06
SOURCE HEIGHT (M) = 3.6600
LENGTH OF LARGER SIDE (M) = 9.8500
LENGTH OF SMALLER SIDE (M) = 9.8500
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.1121E-02	1	1.0	1.0	320.0	3.66	45.
100.	0.4546	6	1.0	1.0	10000.0	3.66	45.
200.	0.3638	6	1.0	1.0	10000.0	3.66	39.
300.	0.2272	6	1.0	1.0	10000.0	3.66	32.
400.	0.1522	6	1.0	1.0	10000.0	3.66	45.
500.	0.1090	6	1.0	1.0	10000.0	3.66	31.
600.	0.8212E-01	6	1.0	1.0	10000.0	3.66	43.
700.	0.6431E-01	6	1.0	1.0	10000.0	3.66	31.
800.	0.5250E-01	6	1.0	1.0	10000.0	3.66	31.
900.	0.4384E-01	6	1.0	1.0	10000.0	3.66	39.

1000.	0.3727E-01	6	1.0	1.0	10000.0	3.66	33.
1100.	0.3230E-01	6	1.0	1.0	10000.0	3.66	31.
1200.	0.2834E-01	6	1.0	1.0	10000.0	3.66	38.
1300.	0.2512E-01	6	1.0	1.0	10000.0	3.66	44.
1400.	0.2246E-01	6	1.0	1.0	10000.0	3.66	31.
1500.	0.2023E-01	6	1.0	1.0	10000.0	3.66	31.
1600.	0.1835E-01	6	1.0	1.0	10000.0	3.66	31.

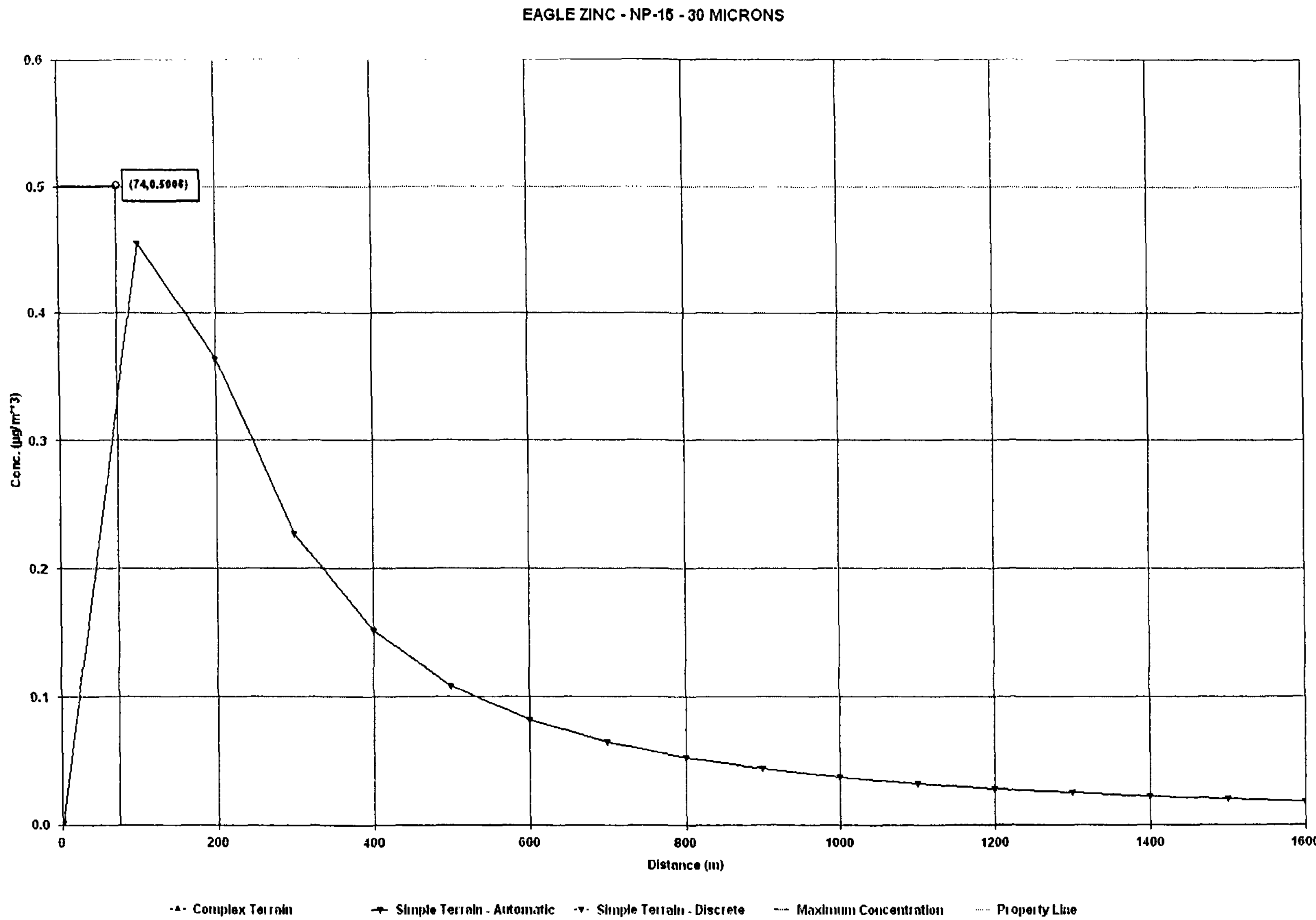
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

74.	0.5006	5	1.0	1.0	10000.0	3.66	45.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.5006	74.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****



EAGLE ZINC - NP-15 - 30 MICRONS
(74,0.5006)
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Conc. (µg/m**3)
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

<u>Residue Pile NP-16</u>

SCREEN3 Output File
10-micron Emission Rate

03/31/2005
12:33:59

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc - NP-16 - 10 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.297000E-06
SOURCE HEIGHT (M) = 7.6200
LENGTH OF LARGER SIDE (M) = 11.1000
LENGTH OF SMALLER SIDE (M) = 11.1000
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.1815E-08	1	1.0	1.0	320.0	7.62	45.
100.	0.7399E-01	4	1.0	1.0	320.0	7.62	43.
200.	0.7336E-01	5	1.0	1.0	10000.0	7.62	39.
300.	0.7075E-01	6	1.0	1.0	10000.0	7.62	38.
400.	0.6144E-01	6	1.0	1.0	10000.0	7.62	45.
500.	0.5033E-01	6	1.0	1.0	10000.0	7.62	37.
600.	0.4106E-01	6	1.0	1.0	10000.0	7.62	31.
700.	0.3387E-01	6	1.0	1.0	10000.0	7.62	45.
800.	0.2853E-01	6	1.0	1.0	10000.0	7.62	31.
900.	0.2439E-01	6	1.0	1.0	10000.0	7.62	31.

1000.	0.2112E-01	6	1.0	1.0	10000.0	7.62	40.
1100.	0.1855E-01	6	1.0	1.0	10000.0	7.62	35.
1200.	0.1645E-01	6	1.0	1.0	10000.0	7.62	32.
1300.	0.1471E-01	6	1.0	1.0	10000.0	7.62	34.
1400.	0.1325E-01	6	1.0	1.0	10000.0	7.62	39.
1500.	0.1201E-01	6	1.0	1.0	10000.0	7.62	45.
1600.	0.1095E-01	6	1.0	1.0	10000.0	7.62	32.

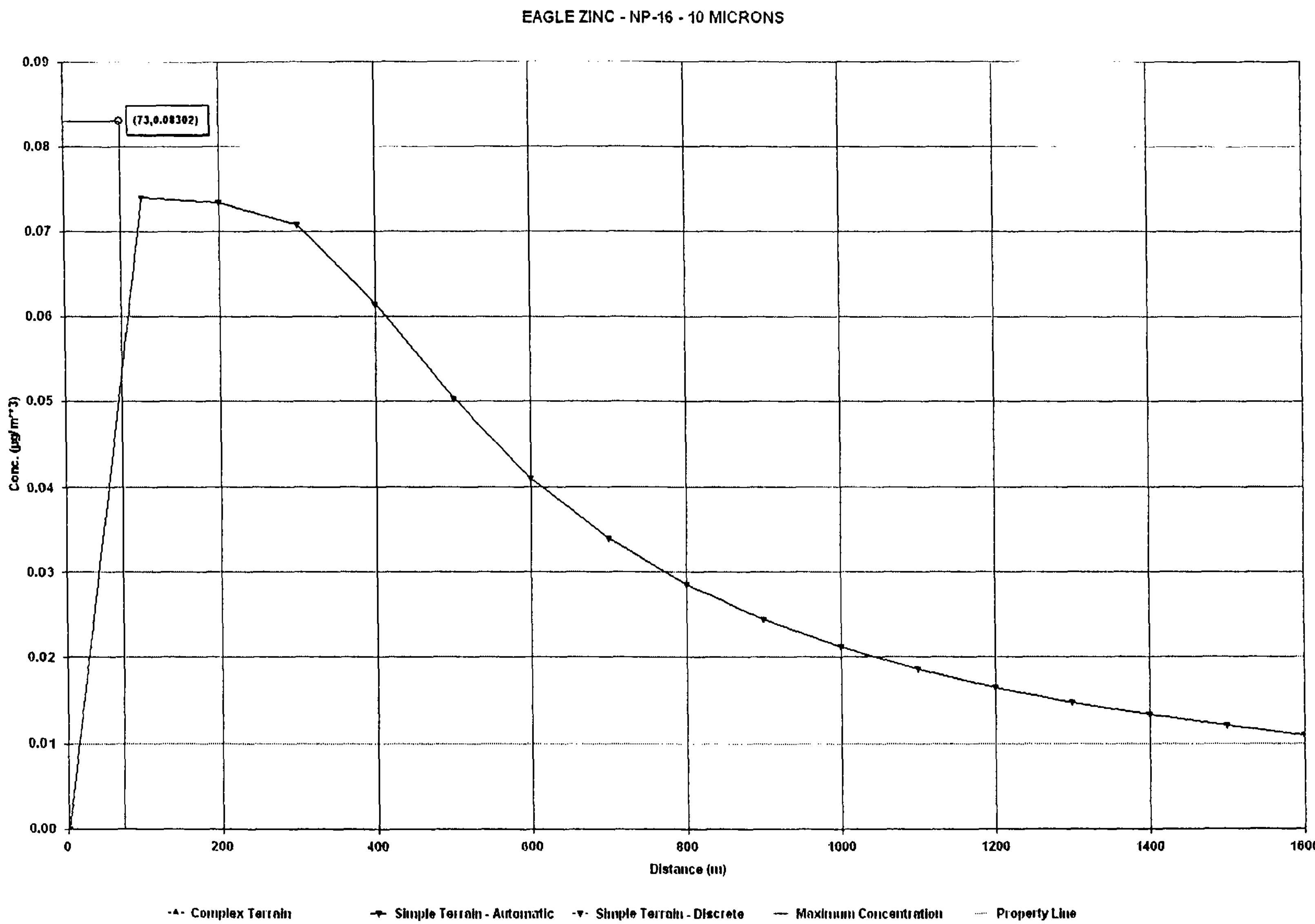
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

73.	0.8302E-01	3	1.0	1.0	320.0	7.62	36.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.8302E-01	73.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****


EAGLE ZINC - NP-16 - 10 MICRONS
(73,0.08302)
Conc. (µg/m^3)
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

Residue Pile NP-16

SCREEN3 Output File
30-micron Emission Rate

03/31/2005
12:31:13

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc - NP-16 - 30 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.593000E-06
SOURCE HEIGHT (M) = 7.6200
LENGTH OF LARGER SIDE (M) = 11.1000
LENGTH OF SMALLER SIDE (M) = 11.1000
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.3624E-08	1	1.0	1.0	320.0	7.62	45.
100.	0.1477	4	1.0	1.0	320.0	7.62	43.
200.	0.1465	5	1.0	1.0	10000.0	7.62	39.
300.	0.1413	6	1.0	1.0	10000.0	7.62	38.
400.	0.1227	6	1.0	1.0	10000.0	7.62	45.
500.	0.1005	6	1.0	1.0	10000.0	7.62	37.
600.	0.8199E-01	6	1.0	1.0	10000.0	7.62	31.
700.	0.6762E-01	6	1.0	1.0	10000.0	7.62	45.
800.	0.5697E-01	6	1.0	1.0	10000.0	7.62	31.
900.	0.4870E-01	6	1.0	1.0	10000.0	7.62	31.

1000.	0.4216E-01	6	1.0	1.0	10000.0	7.62	40.
1100.	0.3703E-01	6	1.0	1.0	10000.0	7.62	35.
1200.	0.3284E-01	6	1.0	1.0	10000.0	7.62	32.
1300.	0.2936E-01	6	1.0	1.0	10000.0	7.62	34.
1400.	0.2645E-01	6	1.0	1.0	10000.0	7.62	39.
1500.	0.2398E-01	6	1.0	1.0	10000.0	7.62	45.
1600.	0.2186E-01	6	1.0	1.0	10000.0	7.62	32.

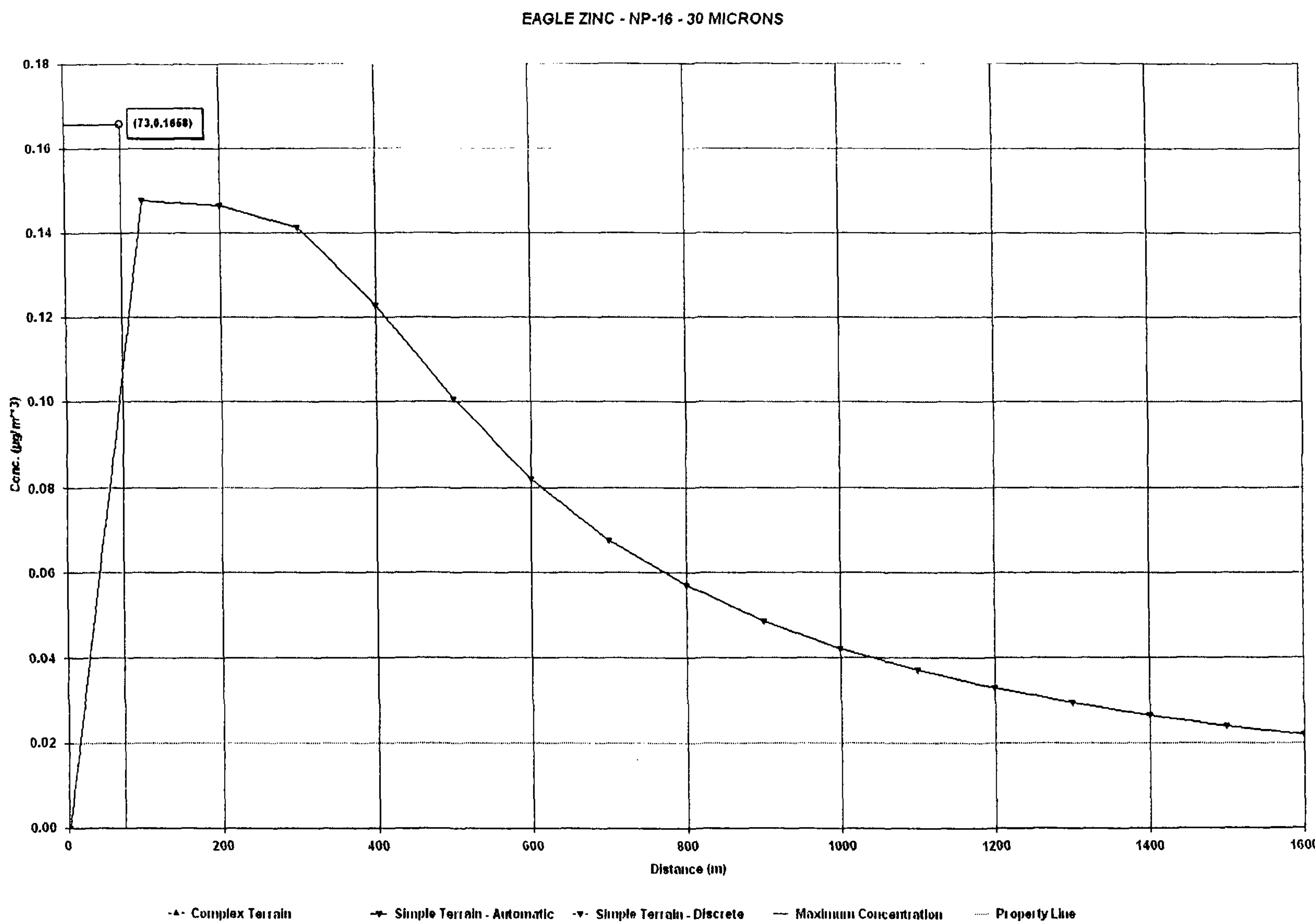
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

73.	0.1658	3	1.0	1.0	320.0	7.62	36.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.1658	73.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****


EAGLE ZINC - NP-16 - 30 MICRONS
(73,0.1658)
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Conc. (µg/ m^3)
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

<u>Residue Pile RCO-10</u>

SCREEN3 Output File
10-micron Emission Rate

03/29/2005
12:34:03

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - RCO-10 - 10 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.297000E-06
SOURCE HEIGHT (M) = 6.1000
LENGTH OF LARGER SIDE (M) = 10.8700
LENGTH OF SMALLER SIDE (M) = 10.8700
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.5122E-06	1	1.0	1.0	320.0	6.10	45.
100.	0.1154	4	1.0	1.0	320.0	6.10	41.
200.	0.1074	6	1.0	1.0	10000.0	6.10	43.
300.	0.9450E-01	6	1.0	1.0	10000.0	6.10	39.
400.	0.7275E-01	6	1.0	1.0	10000.0	6.10	45.
500.	0.5599E-01	6	1.0	1.0	10000.0	6.10	36.
600.	0.4403E-01	6	1.0	1.0	10000.0	6.10	35.
700.	0.3545E-01	6	1.0	1.0	10000.0	6.10	43.
800.	0.2943E-01	6	1.0	1.0	10000.0	6.10	31.
900.	0.2489E-01	6	1.0	1.0	10000.0	6.10	31.

1000.	0.2137E-01	6	1.0	1.0	10000.0	6.10	39.
1100.	0.1865E-01	6	1.0	1.0	10000.0	6.10	31.
1200.	0.1646E-01	6	1.0	1.0	10000.0	6.10	32.
1300.	0.1466E-01	6	1.0	1.0	10000.0	6.10	36.
1400.	0.1316E-01	6	1.0	1.0	10000.0	6.10	31.
1500.	0.1189E-01	6	1.0	1.0	10000.0	6.10	41.
1600.	0.1082E-01	6	1.0	1.0	10000.0	6.10	31.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

58.	0.1211	3	1.0	1.0	320.0	6.10	43.

****

*** SUMMARY OF SCREEN MODEL RESULTS ***

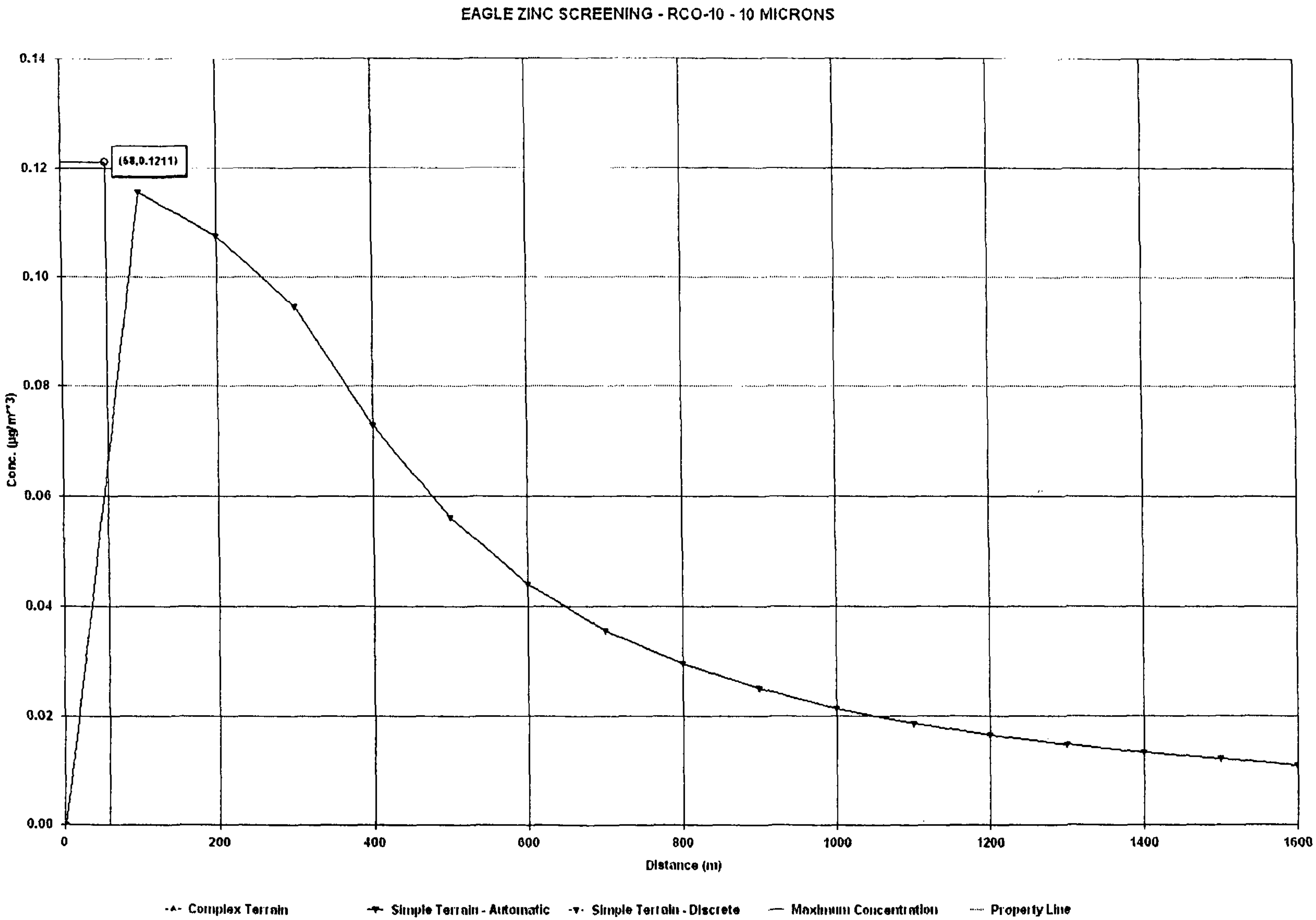
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.1211	58.	0.

****

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

****



EAGLE ZINC SCREENING - RCO-10 - 10 MICRONS
(58,0.1211)
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Conc. (µg/m^3)
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

Residue Pile RCO-10

SCREEN3 Output File
30-micron Emission Rate

03/29/2005
12:31:00

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - RCO-10 - 30 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.593000E-06
SOURCE HEIGHT (M) = 6.1000
LENGTH OF LARGER SIDE (M) = 10.8700
LENGTH OF SMALLER SIDE (M) = 10.8700
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.1023E-05	1	1.0	1.0	320.0	6.10	45.
100.	0.2304	4	1.0	1.0	320.0	6.10	41.
200.	0.2145	6	1.0	1.0	10000.0	6.10	43.
300.	0.1887	6	1.0	1.0	10000.0	6.10	39.
400.	0.1453	6	1.0	1.0	10000.0	6.10	45.
500.	0.1118	6	1.0	1.0	10000.0	6.10	36.
600.	0.8791E-01	6	1.0	1.0	10000.0	6.10	35.
700.	0.7078E-01	6	1.0	1.0	10000.0	6.10	43.
800.	0.5877E-01	6	1.0	1.0	10000.0	6.10	31.
900.	0.4970E-01	6	1.0	1.0	10000.0	6.10	31.

1000.	0.4267E-01	6	1.0	1.0	10000.0	6.10	39.
1100.	0.3724E-01	6	1.0	1.0	10000.0	6.10	31.
1200.	0.3286E-01	6	1.0	1.0	10000.0	6.10	32.
1300.	0.2926E-01	6	1.0	1.0	10000.0	6.10	36.
1400.	0.2627E-01	6	1.0	1.0	10000.0	6.10	31.
1500.	0.2375E-01	6	1.0	1.0	10000.0	6.10	41.
1600.	0.2160E-01	6	1.0	1.0	10000.0	6.10	31.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

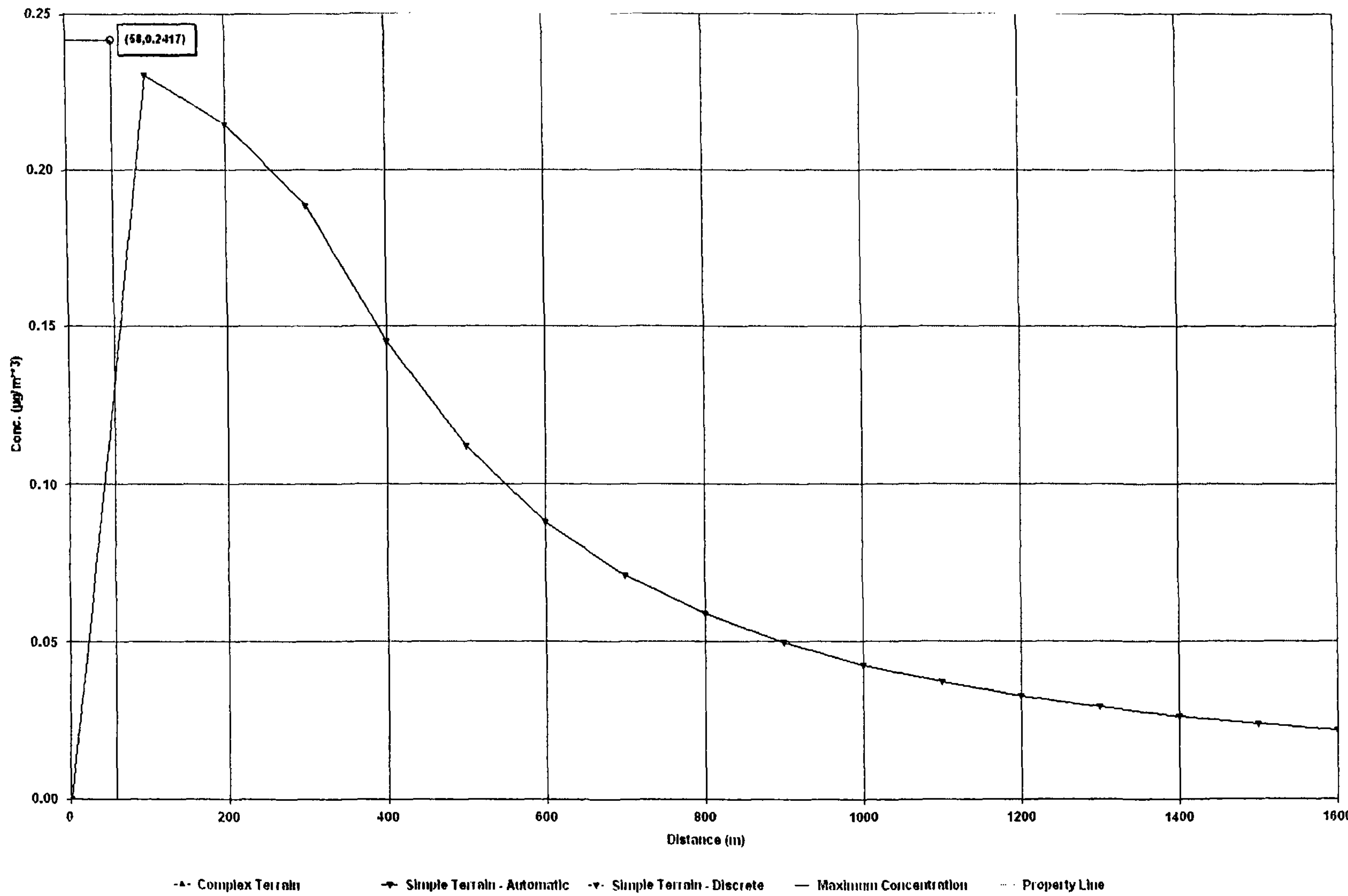
58.	0.2417	3	1.0	1.0	320.0	6.10	43.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.2417	58.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

EAGLE ZINC SCREENING - RCO-10 - 30 MICRONS



Residue Pile RR1-3

SCREEN3 Output File
10-micron Emission Rate

03/29/2005
12:40:36

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - RR1-3 - 10 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.573000E-06
SOURCE HEIGHT (M) = 2.4400
LENGTH OF LARGER SIDE (M) = 18.5200
LENGTH OF SMALLER SIDE (M) = 6.1700
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.1937	1	1.0	1.0	320.0	2.44	0.
100.	1.156	6	1.0	1.0	10000.0	2.44	0.
200.	0.5380	6	1.0	1.0	10000.0	2.44	0.
300.	0.2964	6	1.0	1.0	10000.0	2.44	0.
400.	0.1889	6	1.0	1.0	10000.0	2.44	0.
500.	0.1318	6	1.0	1.0	10000.0	2.44	0.
600.	0.9772E-01	6	1.0	1.0	10000.0	2.44	0.
700.	0.7578E-01	6	1.0	1.0	10000.0	2.44	0.
800.	0.6149E-01	6	1.0	1.0	10000.0	2.44	0.
900.	0.5113E-01	6	1.0	1.0	10000.0	2.44	0.

1000.	0.4332E-01	6	1.0	1.0	10000.0	2.44	0.
1100.	0.3745E-01	6	1.0	1.0	10000.0	2.44	0.
1200.	0.3279E-01	6	1.0	1.0	10000.0	2.44	0.
1300.	0.2901E-01	6	1.0	1.0	10000.0	2.44	0.
1400.	0.2590E-01	6	1.0	1.0	10000.0	2.44	0.
1500.	0.2331E-01	6	1.0	1.0	10000.0	2.44	0.
1600.	0.2111E-01	6	1.0	1.0	10000.0	2.44	0.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

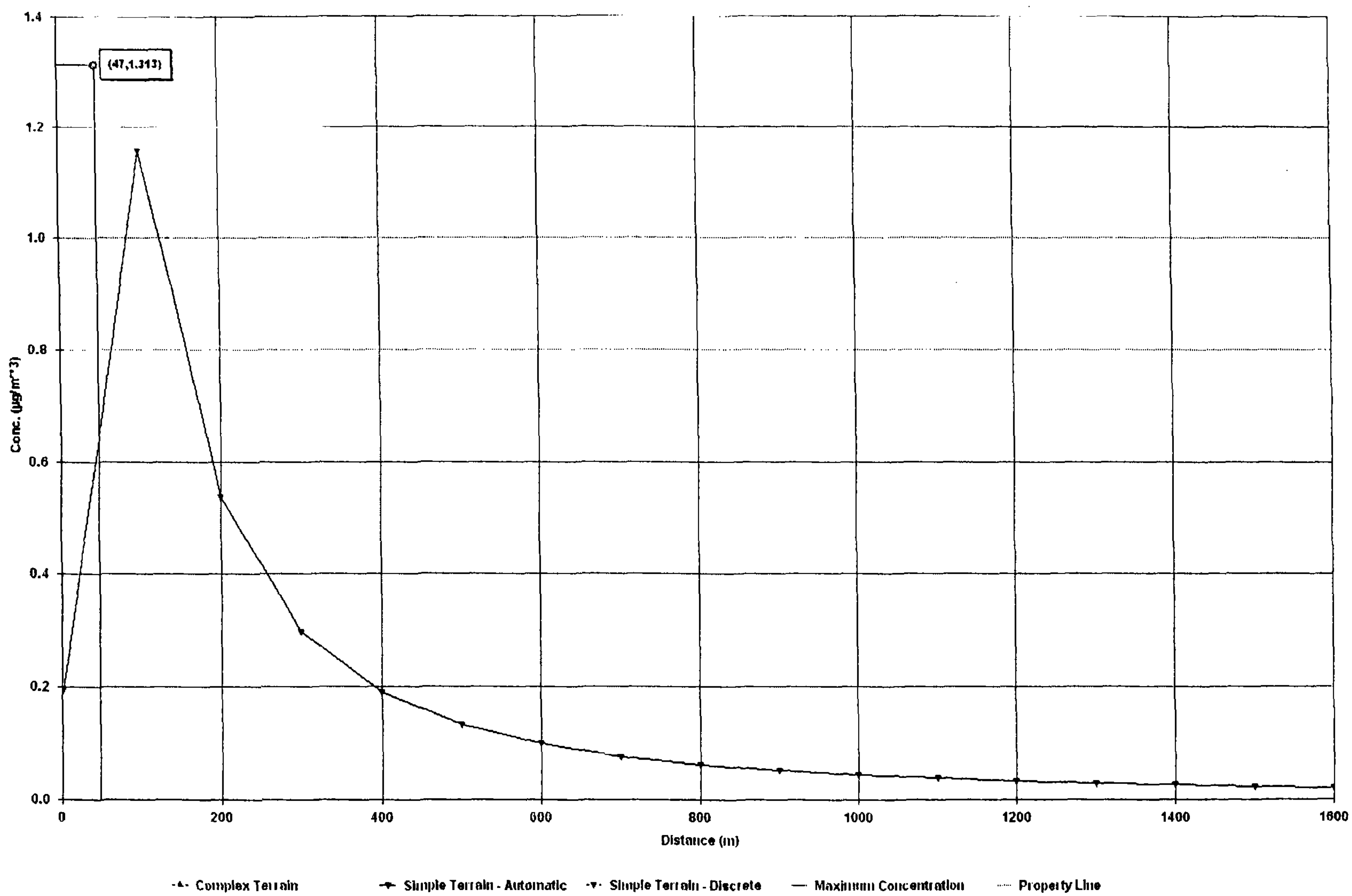
47. 1.313 5 1.0 1.0 10000.0 2.44 0.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	1.313	47.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

EAGLE ZINC SCREENING - RR1-3 - 10 MICRONS



Residue Pile RR1-3

SCREEN3 Output File
30-micron Emission Rate

03/29/2005
12:37:09

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - RR1-3 - 30 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.115000E-05
SOURCE HEIGHT (M) = 2.4400
LENGTH OF LARGER SIDE (M) = 18.5200
LENGTH OF SMALLER SIDE (M) = 6.1700
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.3888	1	1.0	1.0	320.0	2.44	0.
100.	2.321	6	1.0	1.0	10000.0	2.44	0.
200.	1.080	6	1.0	1.0	10000.0	2.44	0.
300.	0.5949	6	1.0	1.0	10000.0	2.44	0.
400.	0.3792	6	1.0	1.0	10000.0	2.44	0.
500.	0.2644	6	1.0	1.0	10000.0	2.44	0.
600.	0.1961	6	1.0	1.0	10000.0	2.44	0.
700.	0.1521	6	1.0	1.0	10000.0	2.44	0.
800.	0.1234	6	1.0	1.0	10000.0	2.44	0.
900.	0.1026	6	1.0	1.0	10000.0	2.44	0.

1000.	0.8694E-01	6	1.0	1.0	10000.0	2.44	0.
1100.	0.7516E-01	6	1.0	1.0	10000.0	2.44	0.
1200.	0.6580E-01	6	1.0	1.0	10000.0	2.44	0.
1300.	0.5822E-01	6	1.0	1.0	10000.0	2.44	0.
1400.	0.5198E-01	6	1.0	1.0	10000.0	2.44	0.
1500.	0.4677E-01	6	1.0	1.0	10000.0	2.44	0.
1600.	0.4237E-01	6	1.0	1.0	10000.0	2.44	0.

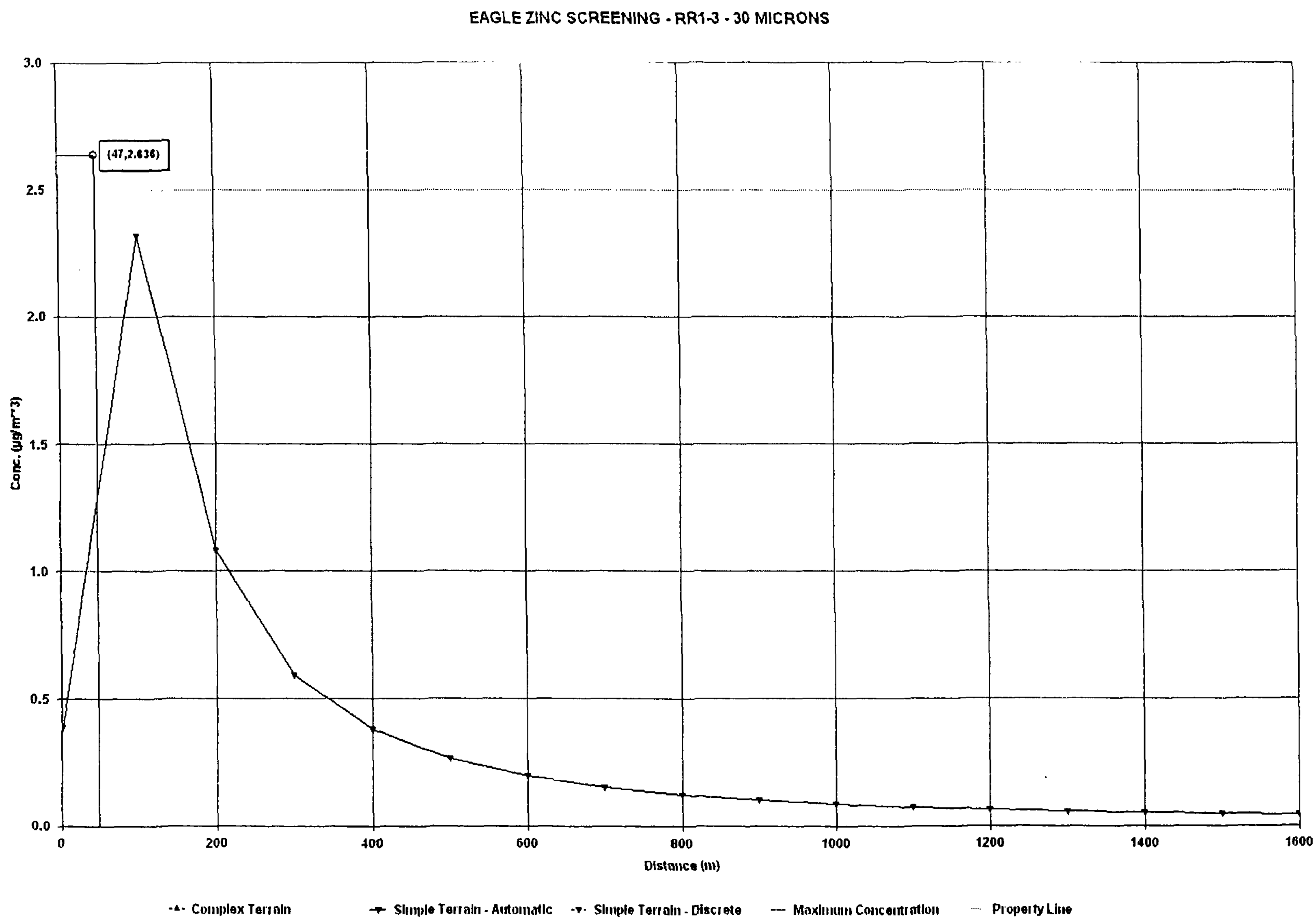
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

47.	2.636	5	1.0	1.0	10000.0	2.44	0.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	2.636	47.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****


EAGLE ZINC SCREENING - RR1-3 - 30 MICRONS
Conc. (µg/m^3)
Distance (m)
(47,2.636)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
200
400
600
800
1000
1200
1400
1600
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

Residue Pile RR2-11

SCREEN3 Output File
10-micron Emission Rate

03/29/2005
12:27:41

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - RR2-11 - 10 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.573000E-06
SOURCE HEIGHT (M) = 9.1500
LENGTH OF LARGER SIDE (M) = 20.9700
LENGTH OF SMALLER SIDE (M) = 10.4900
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.2864E-06	1	1.0	1.0	320.0	9.15	6.
100.	0.1965	3	1.0	1.0	320.0	9.15	0.
200.	0.1821	5	1.0	1.0	10000.0	9.15	1.
300.	0.1629	6	1.0	1.0	10000.0	9.15	0.
400.	0.1638	6	1.0	1.0	10000.0	9.15	0.
500.	0.1448	6	1.0	1.0	10000.0	9.15	0.
600.	0.1235	6	1.0	1.0	10000.0	9.15	0.
700.	0.1049	6	1.0	1.0	10000.0	9.15	0.
800.	0.9001E-01	6	1.0	1.0	10000.0	9.15	0.
900.	0.7791E-01	6	1.0	1.0	10000.0	9.15	0.

1000.	0.6811E-01	6	1.0	1.0	10000.0	9.15	0.
1100.	0.6026E-01	6	1.0	1.0	10000.0	9.15	0.
1200.	0.5376E-01	6	1.0	1.0	10000.0	9.15	0.
1300.	0.4832E-01	6	1.0	1.0	10000.0	9.15	0.
1400.	0.4372E-01	6	1.0	1.0	10000.0	9.15	0.
1500.	0.3979E-01	6	1.0	1.0	10000.0	9.15	0.
1600.	0.3640E-01	6	1.0	1.0	10000.0	9.15	0.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

88.	0.2013	3	1.0	1.0	320.0	9.15	1.

****

*** SUMMARY OF SCREEN MODEL RESULTS ***

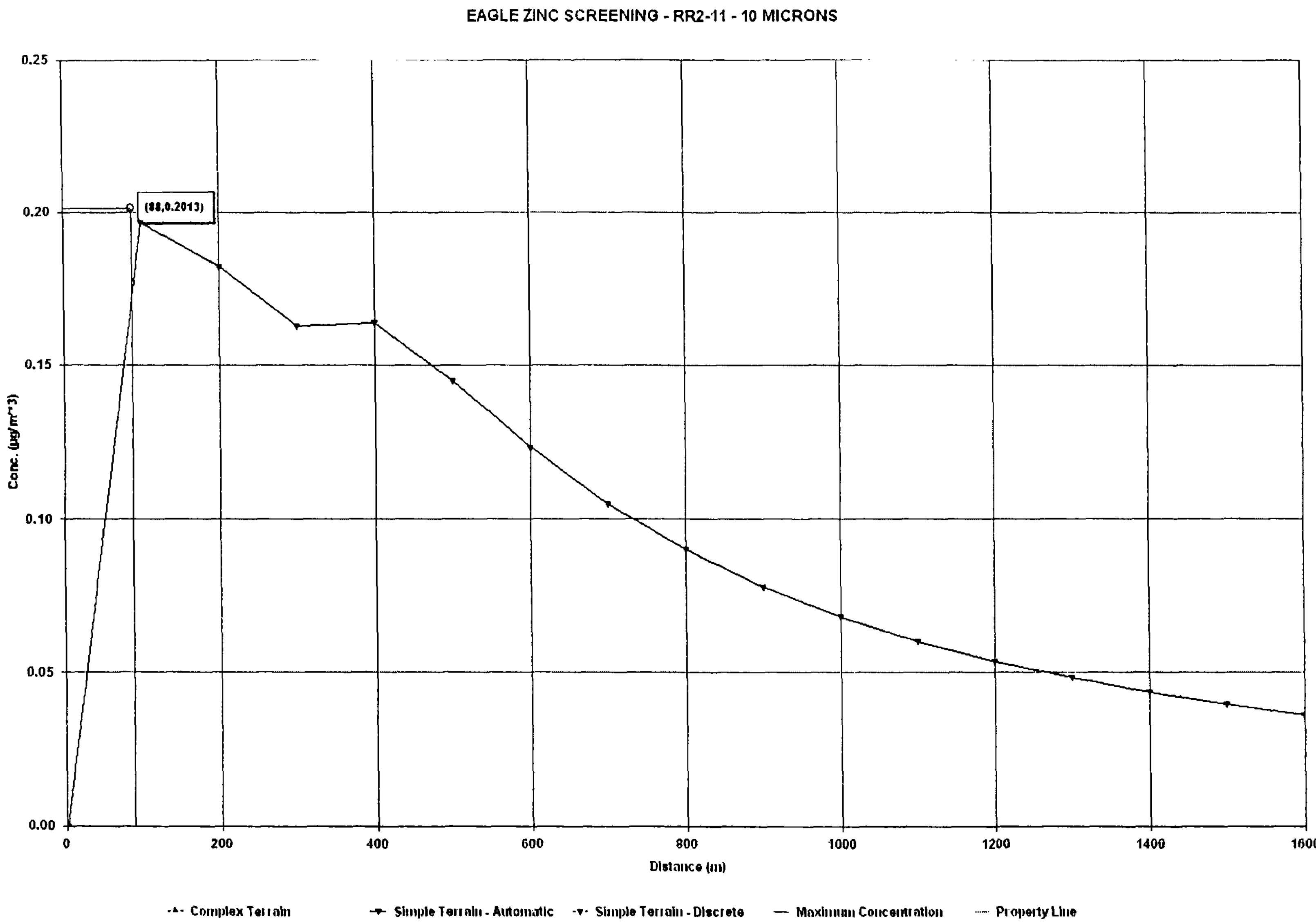
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.2013	88.	0.

****

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

****



EAGLE ZINC SCREENING - RR2-11 - 10 MICRONS
0.25
0.20
0.15
0.10
0.05
0.00
Conc. (µg/m^3)
(88,0.2013)
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

Residue Pile RR2-11

SCREEN3 Output File
30-micron Emission Rate

03/29/2005
12:19:42

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc Screening - Pile RR2-11 - 30 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.115000E-05
SOURCE HEIGHT (M) = 9.1500
LENGTH OF LARGER SIDE (M) = 20.9700
LENGTH OF SMALLER SIDE (M) = 10.4900
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.5748E-06	1	1.0	1.0	320.0	9.15	6.
100.	0.3943	3	1.0	1.0	320.0	9.15	0.
200.	0.3654	5	1.0	1.0	10000.0	9.15	1.
300.	0.3270	6	1.0	1.0	10000.0	9.15	0.
400.	0.3287	6	1.0	1.0	10000.0	9.15	0.
500.	0.2905	6	1.0	1.0	10000.0	9.15	0.
600.	0.2478	6	1.0	1.0	10000.0	9.15	0.
700.	0.2106	6	1.0	1.0	10000.0	9.15	0.
800.	0.1807	6	1.0	1.0	10000.0	9.15	0.
900.	0.1564	6	1.0	1.0	10000.0	9.15	0.

1000.	0.1367	6	1.0	1.0	10000.0	9.15	0.
1100.	0.1209	6	1.0	1.0	10000.0	9.15	0.
1200.	0.1079	6	1.0	1.0	10000.0	9.15	0.
1300.	0.9698E-01	6	1.0	1.0	10000.0	9.15	0.
1400.	0.8775E-01	6	1.0	1.0	10000.0	9.15	0.
1500.	0.7985E-01	6	1.0	1.0	10000.0	9.15	0.
1600.	0.7306E-01	6	1.0	1.0	10000.0	9.15	0.

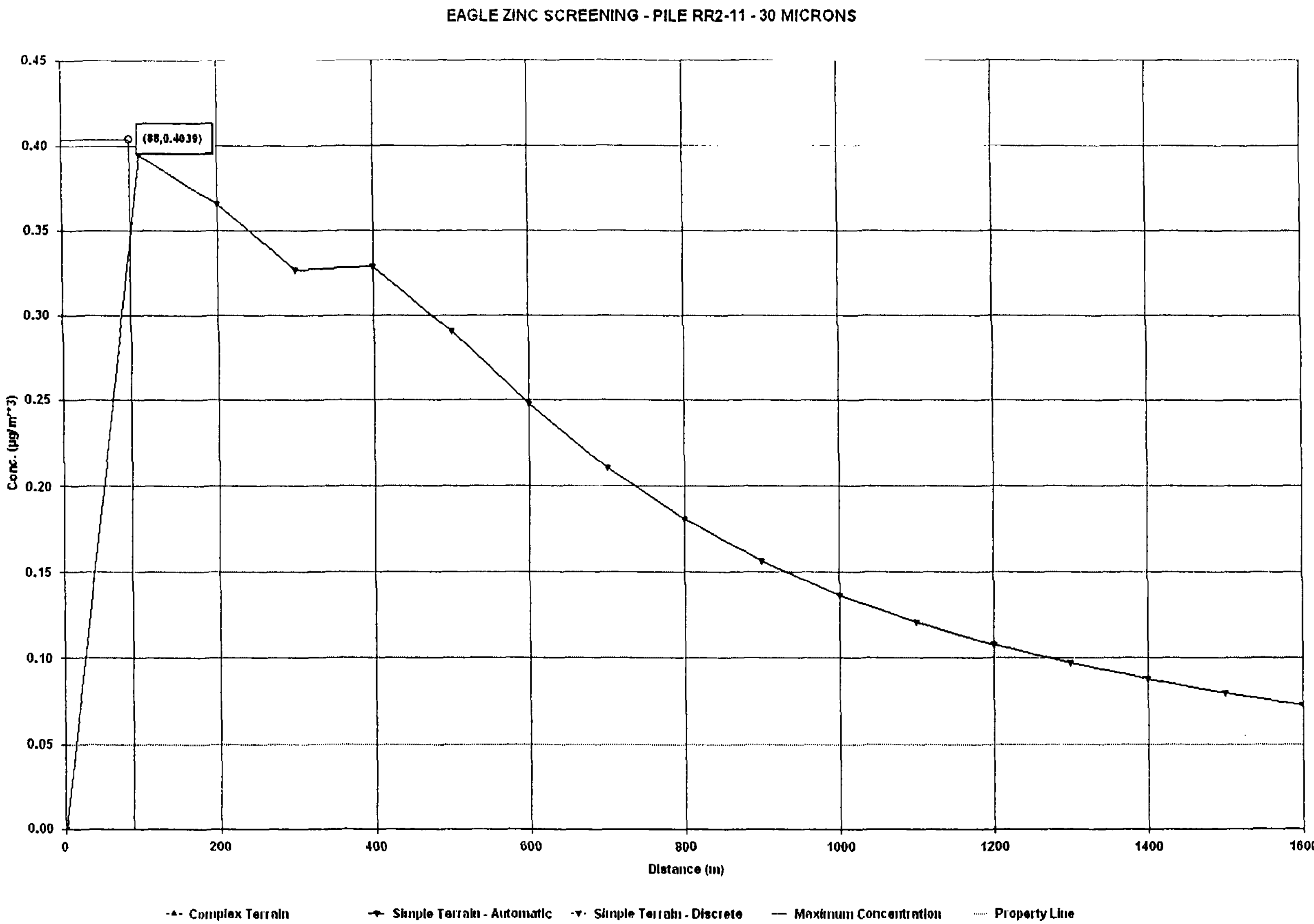
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

88.	0.4039	3	1.0	1.0	320.0	9.15	1.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.4039	88.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****


EAGLE ZINC SCREENING - PILE RR2-11 - 30 MICRONS
(88,0.4039)
Conc. (µg/m^3)
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
200
400
600
800
1000
1200
1400
1600
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

<u>Residue Pile RRO-12</u>

SCREEN3 Output File
10-micron Emission Rate

03/31/2005
12:22:21

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc - RRO-12 - 10 microns ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.573000E-06
SOURCE HEIGHT (M) = 4.5700
LENGTH OF LARGER SIDE (M) = 21.2900
LENGTH OF SMALLER SIDE (M) = 10.6400
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.1493E-01	1	1.0	1.0	320.0	4.57	1.
100.	0.7300	5	1.0	1.0	10000.0	4.57	0.
200.	0.6479	6	1.0	1.0	10000.0	4.57	0.
300.	0.4530	6	1.0	1.0	10000.0	4.57	0.
400.	0.3174	6	1.0	1.0	10000.0	4.57	0.
500.	0.2328	6	1.0	1.0	10000.0	4.57	0.
600.	0.1777	6	1.0	1.0	10000.0	4.57	0.
700.	0.1405	6	1.0	1.0	10000.0	4.57	0.
800.	0.1154	6	1.0	1.0	10000.0	4.57	0.
900.	0.9667E-01	6	1.0	1.0	10000.0	4.57	0.

1000.	0.8242E-01	6	1.0	1.0	10000.0	4.57	0.
1100.	0.7159E-01	6	1.0	1.0	10000.0	4.57	0.
1200.	0.6293E-01	6	1.0	1.0	10000.0	4.57	0.
1300.	0.5587E-01	6	1.0	1.0	10000.0	4.57	0.
1400.	0.5003E-01	6	1.0	1.0	10000.0	4.57	0.
1500.	0.4513E-01	6	1.0	1.0	10000.0	4.57	0.
1600.	0.4097E-01	6	1.0	1.0	10000.0	4.57	0.

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

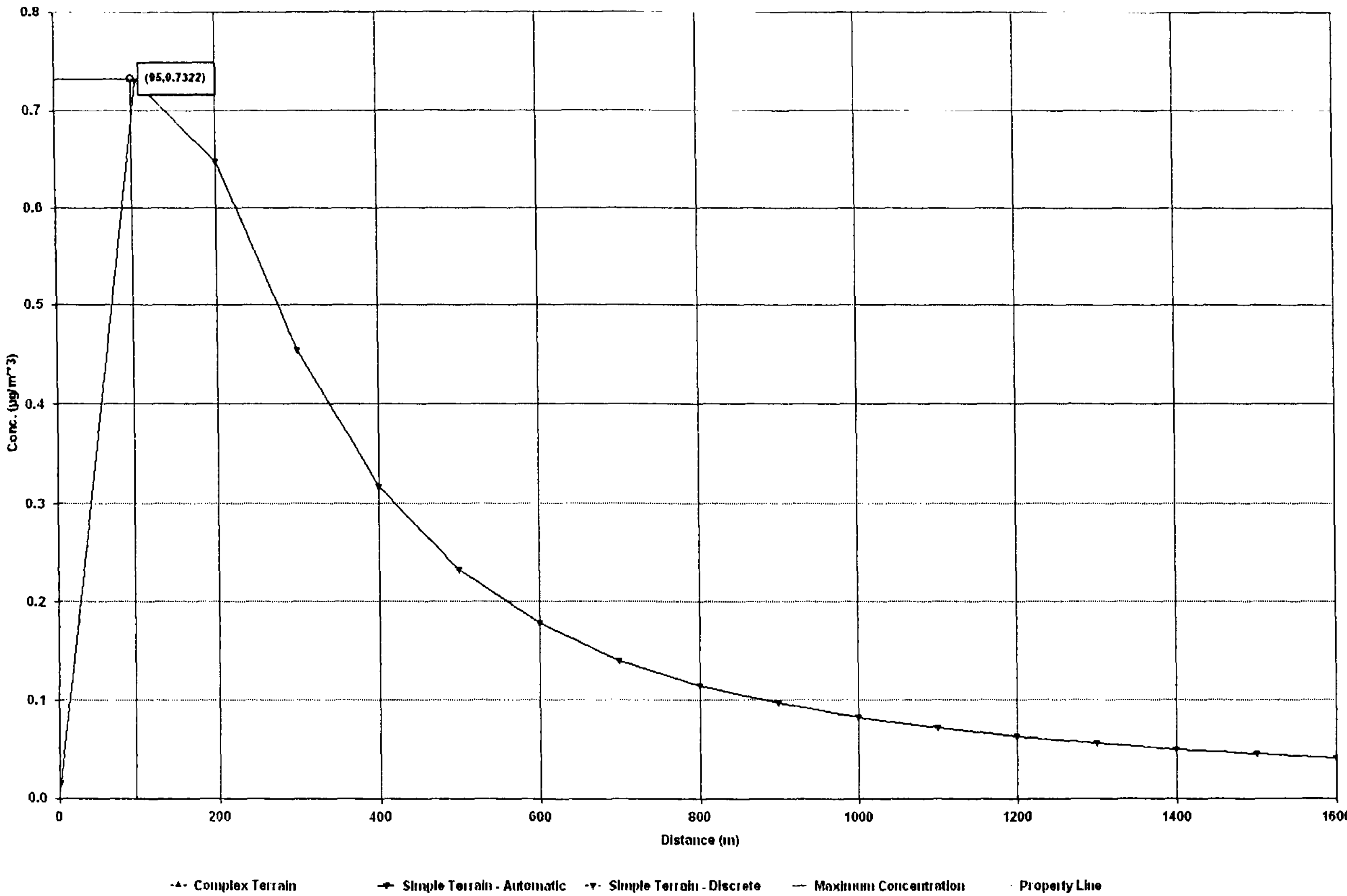
95. 0.7322 5 1.0 1.0 10000.0 4.57 0.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.7322	95.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

EAGLE ZINC - RRO-12 - 10 MICRONS



<u>Residue Pile RRO-12</u>

SCREEN3 Output File
30-micron Emission Rate

03/31/2005
12:17:40

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Zinc - RRO-12 - 30 micron ** 0

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = AREA
EMISSION RATE (G/(S-M**2)) = 0.115000E-05
SOURCE HEIGHT (M) = 4.5700
LENGTH OF LARGER SIDE (M) = 21.2900
LENGTH OF SMALLER SIDE (M) = 10.6400
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

MODEL ESTIMATES DIRECTION TO MAX CONCENTRATION

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	MAX DIR (DEG)
1.	0.2997E-01	1	1.0	1.0	320.0	4.57	1.
100.	1.465	5	1.0	1.0	10000.0	4.57	0.
200.	1.300	6	1.0	1.0	10000.0	4.57	0.
300.	0.9091	6	1.0	1.0	10000.0	4.57	0.
400.	0.6371	6	1.0	1.0	10000.0	4.57	0.
500.	0.4672	6	1.0	1.0	10000.0	4.57	0.
600.	0.3566	6	1.0	1.0	10000.0	4.57	0.
700.	0.2820	6	1.0	1.0	10000.0	4.57	0.
800.	0.2316	6	1.0	1.0	10000.0	4.57	0.
900.	0.1940	6	1.0	1.0	10000.0	4.57	0.

1000.	0.1654	6	1.0	1.0	10000.0	4.57	0.
1100.	0.1437	6	1.0	1.0	10000.0	4.57	0.
1200.	0.1263	6	1.0	1.0	10000.0	4.57	0.
1300.	0.1121	6	1.0	1.0	10000.0	4.57	0.
1400.	0.1004	6	1.0	1.0	10000.0	4.57	0.
1500.	0.9057E-01	6	1.0	1.0	10000.0	4.57	0.
1600.	0.8223E-01	6	1.0	1.0	10000.0	4.57	0.

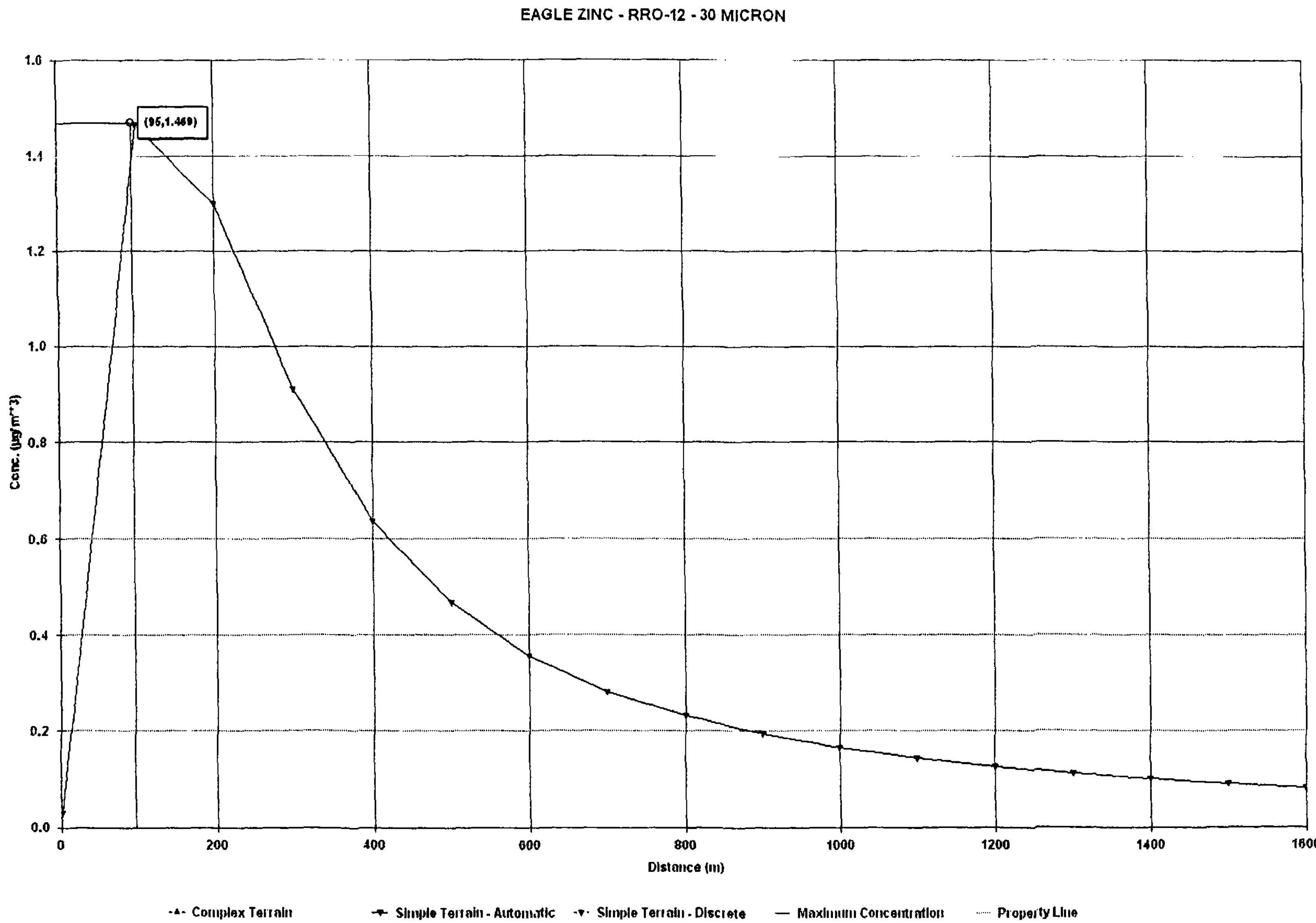
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

95.	1.469	5	1.0	1.0	10000.0	4.57	0.

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	1.469	95.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****


EAGLE ZINC - RRO-12 - 30 MICRON
(95,1.469)
Conc. (µg/m**3)
Distance (m)
Complex Terrain
Simple Terrain - Automatic
Simple Terrain - Discrete
Maximum Concentration
Property Line

APPENDIX H
SCREEN3 MODEL DISPERSION RESULTS, 10 MICRONS

10 MICRON, 1 HOUR CONCENTRATION RESULTS - TO BE USED FOR DEPOSITION/SOIL PATHWAY								
Distance from Source (m)	1 Hour Concentration (ug/m^3)							
	RR2-11	RCO-10	RR1-3	CPH-9	CPH-6	RRO-12	NP-15	NP-16
1	2.864E-07	5.122E-07	1.937E-01	6.306E-09	1.636E-08	1.493E-02	5.616E-04	1.815E-09
100	1.965E-01	1.154E-01	1.156E+00	7.481E-02	7.547E-02	7.300E-01	2.277E-01	7.399E-02
200	1.821E-01	1.074E-01	5.380E-01	7.127E-02	6.496E-02	6.479E-01	1.822E-01	7.336E-02
300	1.629E-01	9.450E-02	2.964E-01	5.568E-02	4.425E-02	4.530E-01	1.138E-01	7.075E-02
400	1.638E-01	7.275E-02	1.889E-01	4.087E-02	3.072E-02	3.174E-01	7.623E-02	6.144E-02
500	1.448E-01	5.599E-02	1.318E-01	3.069E-02	2.242E-02	2.328E-01	5.458E-02	5.033E-02
600	1.235E-01	4.403E-02	9.772E-02	2.378E-02	1.708E-02	1.777E-01	4.113E-02	4.106E-02
700	1.049E-01	3.545E-02	7.578E-02	1.897E-02	1.347E-02	1.405E-01	3.221E-02	3.387E-02
800	9.001E-02	2.943E-02	6.149E-02	1.566E-02	1.104E-02	1.154E-01	2.629E-02	2.853E-02
900	7.791E-02	2.489E-02	5.113E-02	1.318E-02	9.253E-03	9.667E-02	2.196E-02	2.439E-02
1000	6.811E-02	2.137E-02	4.332E-02	1.128E-02	7.887E-03	8.242E-02	1.866E-02	2.112E-02
1100	6.026E-02	1.865E-02	3.745E-02	9.823E-03	6.850E-03	7.159E-02	1.618E-02	1.855E-02
1200	5.376E-02	1.646E-02	3.279E-02	8.652E-03	6.020E-03	6.293E-02	1.419E-02	1.645E-02
1300	4.832E-02	1.466E-02	2.901E-02	7.693E-03	5.342E-03	5.587E-02	1.258E-02	1.471E-02
1400	4.372E-02	1.316E-02	2.590E-02	6.898E-03	4.782E-03	5.003E-02	1.125E-02	1.325E-02
1500	3.979E-02	1.189E-02	2.331E-02	6.228E-03	4.312E-03	4.513E-02	1.013E-02	1.201E-02
1600	3.640E-02	1.082E-02	2.111E-02	5.659E-03	3.913E-03	4.097E-02	9.190E-03	1.095E-02
MAX - Distance Specified	**88 m** **2.013E-01**	**58 m** **1.211E-01**	**47 m** **1.313E+00**	**51 m** **7.988E-02**	**90 m** **7.662E-02**	**95 m** **7.322E-01**	**74 m** **2.507E-01**	**73 m** **8.302E-02**

Note: Piles RR1-4, NP-13, NP-14, RCO-5, MP1-21, RR1-2 and RR1-1 result in a friction velocity less than the threshold friction velocity. Therefore, no emissions due to wind erosion occur.